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CARCINOMA OF THE ESOPHAGUS: AN ANALYSIS OF SIXTY-ONE CASES*

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CARCINOMA of the esophagus is a distressing disease to encounter, for it has usually reached such an advanced stage before medical aid is sought, as to preclude the expectation of cure. This makes the condition even more hopeless than cancer of the stomach. The disease is, fortunately, not very common, but the infrequency with which it is met gives the average physician little opportunity to acquaint himself with its early symptoms.

A few years ago, one of us (E. S. E.) suspected the presence of an esophageal cancer, but an x-ray examination was negative. The symptoms did not seem sufficient to warrant the discomfort and expense of an esophagoscopy and the patient was allowed to return home. He did not report, as requested, but returned a year later with an advanced cancer at the cardia. This experience led us to investigate the cases that have been seen at the Peter Bent Brigham Hospital, to discover if and how this disease may be diagnosed earlier.

Our findings coincide, in general, with the experience of others[1]. Carcinoma of the esophagus has been diagnosed 61 times in approximately 41,000 admissions to the medical service‡.

Involvement of the esophagus occurred well within the accepted age for cancer, more frequently between 50 and 60 years. The youngest patient in the series was a man of 44, and the oldest a male patient of 75 years. There were 48 male and 13 female patients.

SYMPTOMS

The characteristic history is that of obstruction, which increases gradually and continuously. At first the larger pieces of food stick in the esophagus, but scant attention is given the symptoms, for the sensation is little different from that experienced with rapid eating and insufficient mastication. The symptom becomes increasingly frequent and occurs with smaller and smaller substances until swallowing becomes difficult for anything but liquids. This story is in marked contrast to that told by patients with cardiospasm. Patients with the latter affliction also have symptoms of obstruction, but the symptoms come and go. Because the obstruction is due to spasm, it is as complete for liquids as for solids. Patients, therefore, can eat everything or can swallow nothing. They do not experience symptoms of partial obstruction. An accurate history of gradually increasing obstruction is, on this account, of extreme diagnostic importance. Unfortunately, all esophageal carcinomata do not give this typical history, which was obtained from only 58.3 per cent of the patients in this series. Moreover, patients seen early in the course of the disease do not usually give a characteristic story and one must rely upon a single symptom for a clue to an early diagnosis.

Dysphagia was the most common symptom and occurred in all but one patient. Thirty-eight patients had pain, which was second in frequency. The quality of pain varied greatly in different individuals and was not characteristic. Some described it indefinitely as discomfort, several spoke of it as heartburn or a burning pain. The pain was constant or severe enough, in a few instances, to require morphine.

The location of the pain agreed with the position of the lesion in twenty-five of the thirty-eight patients in whom it occurred. Six patients who showed a lesion at the cardia had discomfort in the mid-epigastrium, and one at the umbilicus. It is possible that the disease in these cases started in the stomach and later involved the cardia, thus perhaps explaining the epigastric location.

A lesion in the middle third of the esophagus, in one case, produced pain only in the back. It is interesting that five patients with a cancer in the middle third of the esophagus had pain only in the epigastrium. This suggests that the disease involved the posterior roots of the neighboring spinal nerves resulting in a referred pain. There seemed to be no direct relationship of the location, radiation, and the character of the pain to the presence of metastatic growths in other organs, possibly due to the fact that metastases occur rather late in the disease. One case in which metastases were most extensive—lungs, liver, kidneys, adrenals, retroperitoneal glands and skin, showed only

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‡Every readmission gets a new number. No figure is available for the number of individual patients that have been admitted to the hospital.

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substernal pain. Other symptoms occurred in the following order of frequency: obstruction became marked enough to cause regurgitation in thirty-two patients; hoarseness occurred in nine; hematemesis in seven, and cough in four.

The disease had reached quite an advanced stage in all the patients at the time of entering the hospital, yet a definite diagnosis had not been made prior to entry. Much of the difficulty lies in the insidious nature of the disease. As already pointed out, the symptom of dysphagia is present most commonly, but as this symptom may be late in coming on, it is of little value in making an early diagnosis. Pain is also of little value in this regard, as it was absent in twenty-three patients, or thirty-six per cent of this series.

An analysis shows no one symptom that can be looked for as the first evidence of the disease. Dysphagia was the first symptom in twenty-five patients, pain in twenty-two, regurgitation in five, hoarseness in three, loss of weight in two, a feeling of fullness in two, pain and dysphagia in one, and weakness in one.

Table I shows the duration of symptoms before they became severe enough to bring the patients to the hospital; 54.1 per cent of the patients had had symptoms less than six months. However, 21.4 per cent had experienced symptoms for one year or longer. The patient with symptoms for five years gave a story suggesting

TABLE I

TIME ELAPSING BETWEEN ONSET OF SYMPTOMS AND VISIT TO THE HOSPITAL

Five Months or Less		Six Months to One Year	One Year or More	
3 weeks	1 case	15 cases	1 year	9 cases
1 month	3 cases		2 years	3 "
2 months	11 "		5 "	1 case
3 "	8 "			
4 "	5 "			
5 "	5 "			
	33			
Average	54.1%	24.5% cases	21.4% cases	

intermittent spasm for four years. He had been seen in various clinics during this time and nothing was found. Gradually increasing obstruction developed during the last year. Little can be hoped for in the way of an early diagnosis in the former group of cases. They represent patients in whom symptoms were so long delayed, or in whom the disease progressed so rapidly, that the opportunities for an early diagnosis are slight.

As there are no typical symptoms in the early stages, recourse must be had to the laboratory procedures[2]. These include the use of the x-ray and of esophagoscopy. Whoever has seen a number of these patients knows that the diagnostic methods have a definite factor of error[2]. The diagnosis was missed by the x-ray in five instances in this series, or 8.1%. On one occasion the report was "benign constriction", although only a few weeks later an autopsy revealed a carcinoma of the esophagus with widespread metastases. Another patient was thought to have an "extrinsic lesion" but autopsy proved it to be carcinoma of the esophagus. No constriction or irregularity was noticed in another patient, but esophagoscopy and biopsy established the diagnosis of carcinoma. The next two cases are important because they involve the problem of distinguishing between an obstruction due to cardiospasm and one due to malignancy. This was forcibly impressed upon one of us by the following case:

CASE No. 61, Medical No. 26590, a 49 year old man, entered the hospital in October, 1925, complaining of dysphagia. For two months he had had symptoms of increasing dysphagia, with the sensation of food sticking beneath the lower end of the sternum. The story was typical of an obstruction by a malignant lesion, but the x-ray findings were typical of cardiospasm, and he was discharged from the wards to the Out-Door Department for dilatation. Because the story was so typical for cancer, a second x-ray examination was requested and the roentgenologist assured us it was a cardiospasm. However, a biopsy done two months later definitely demonstrated a carcinoma.

A similar situation occurred in one other case. A lesion, which was later shown to be a carcinoma, gave an appearance of cardiospasm by the x-ray. This kind of error may have serious consequences. The usual treatment for cardiospasm is overdistention by some form of rubber bag, whereas dilatation of a carcinoma must be done gradually with graded bougies. Dilatation of a carcinoma with a large bag may rupture the lesion and result in a fatal mediastinitis. When the x-ray disagrees with the other findings, it is wiser to assume that the lesion is malignant until proved otherwise. Our own experience has taught us that a typical story of carcinoma is more likely to be correct than the findings by x-ray.

Esophagoscopy is another aid in diagnosis. Its use has been limited in the past, owing to the lack of men available for performing such an operation. Moreover, it is a rather unpleasant procedure for the patient unless performed by an experienced operator. Physicians have, therefore, hesitated to subject their patients unnecessarily to this form of diagnosis. As the method is now generally available, it becomes important to know how much reliance should be placed upon its findings. An esophagoscopy was performed on twenty-one patients, and confirmed the diagnosis in seventeen. In two patients, the operator found the lesion, but removed normal instead of diseased tissue for biopsy. An incorrect diagnosis was made in two patients. The lesion was thought to be benign in one of the patients, and normal tissue was

removed. The lesion was not found in the second patient.

These figures show that esophagoscopy has about the same relative value as the x-ray. Both have a high degree of accuracy so far as figures are concerned, but both methods of diagnosis may be very inaccurate for the individual case. If there is any doubt about the correctness of the diagnosis, therefore, it is well to supplement one type of investigation with the other.

As a result of this study, it is the authors' impression that where a conflict exists between a typical history and the laboratory findings, the history should be relied upon. Where the history is doubtful, it is always well to supplement the x-ray with an esophagoscopy. A positive report from a biopsy, of course, makes a diagnosis, but one should attach little importance to a negative report from a biopsy in opposition to a positive finding by the x-ray.

While on the subject of diagnosis, attention should be called to the presenting symptoms in two of our patients. Both complained of spasm occurring in the upper third of the esophagus just below the pharynx. The symptoms were severe enough to make deglutition extremely difficult. An x-ray examination of the esophagus failed to show a cause for the complaint; whereas more careful examinations revealed a carcinoma of the stomach, involving the cardia. The symptoms were so misleading in one of these patients that she was about to be discharged with a diagnosis of psychoneurosis when the true nature of her trouble was discovered. Spasm high in the esophagus can, therefore, result from a lesion in or near the cardia.

TREATMENT AND PROGNOSIS

All treatments given in this series were palliative. Forty gastrostomies were performed either by the method of Wetzel or Senn. Nine of the patients did not report again and the final outcome is not known. The duration of life after operation was, on the average, four months. The longest duration was two years, in one case.

Three cases were treated with radium and another three with x-ray therapy. Very little was accomplished and two patients were operated upon afterwards.

Two patients were treated by dilatation with only moderate success. No treatment was given fifteen patients, of whom the final outcome is not known in eight. Those that were followed lived on an average of six to seven months after being seen.

SUMMARY AND CONCLUSIONS

An analysis has been made of 61 cases with carcinoma of the esophagus, in all of whom the disease was advanced by the time a diagnosis was made. No symptoms were found that could be recognized as early manifestations of the disease, although dysphagia was the first symptom in twenty-five patients and pain in twenty-two patients. As these symptoms are not characteristic, one should use both the x-ray and the esophagoscope if one hopes to make an early diagnosis. In the later stages a typical history of gradually increasing obstruction may develop, but this was present in only fifty-eight per cent of the patients. A typical story is so diagnostic that it is usually safe to make a tentative diagnosis of carcinoma even though it is not confirmed by the x-ray or esophagoscope.

REFERENCES

1 Sippy, Bertram W.: Diseases of the esophagus. Forchheimer's Therapeusis of Internal Diseases. New York, D. Appleton & Co., 1913. Vol. 3, chap. 4, p. 47.
McCullagh, E. P.: Cancer of the esophagus. M. J. & Record. 132-288 (Sept. 17) 1930.
Vinson, Porter P.: Carcinoma of the esophagus. Am. J. M. Sc. 166:402, 1923.
2 Jackson, Chevalier: Carcinoma and sarcoma of the esophagus: a plea for early diagnosis. J. Radiol. 6:485 (Dec.) 1925.
Vinson, Porter P., and Moersch, Herman J.: The differential diagnosis of lesions of the lower part of the esophagus and cardiac end of the stomach. M. Clin. N. Amer. 11:1389 (May) 1928.
Sherman, Julius: Carcinoma of the esophagus. Am. J. M. Sc. 175:79 (Jan.) 1928.
Vinson, P. P.: Cicatricial (benign) stricture of oesophagus of unknown origin. Surg. Gynec. Obst. 52:955 (May) 1931.

STUDIES IN FAT METABOLISM.
V. OBSERVATIONS ON THE LIPIDS AND THE PHOSPHORUS COMPOUNDS OF HUMAN BILE*

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DATA obtained from studies on the lipids and the phosphorus compounds of human bile are reported. The studies include observations on the absolute amounts of the various lipid fractions and phosphorus compounds and their origin.

Analyses of bile of both man and lower animals have been made by various investigators. The results of these analyses demonstrate that bile is an aqueous solution or suspension of the solid constituents among which are bile salts, bile pigments, cholesterol, mucin, ethereal sulphates, conjugated glycuronic acids, fats, soaps, phospholipids, and sodium, phosphorus, calcium, magnesium, iron, and copper in combination with hydrochloric acid, phosphoric acid and sulphuric acid[1]; urea also has been found[2]. The various solid constituents are end results of

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diverse activities of both endogenous and exogenous hepatic metabolism. It is for this reason that their significance in bile is so important and that both physiological and pathological investigations of their biochemistry have been stimulated. The biochemistry of the bile pigments has received much attention. Whipple[3], among others, has studied the subject of their formation from hemoglobin and concludes that body protein, body cells and food products are among the sources from which they may be formed. Relatively accurate chemical methods for estimating bile pigments have been devised by Whipple[3] and by McClure and coworkers[4]. The latter investigators have devised methods for isolating both alcohol soluble and insoluble groups of pigments. The factors influencing the concentration of these classes of pigments in bile have been studied. Different foodstuffs were found to have a marked influence and also both organic and functional disorders of the liver[5]. Bile acids have also been the subject of numerous biochemical studies, and it has been shown that they are of both endogenous and exogenous origin[6]. Wieland and Weil[7] and Windaus and Neukirchen[8] have shown so close a relationship chemically between cholic acid and cholesterol that the synthesis of bile acids from the latter in the body has been suggested. The bile acids have been found to be active cholagogues[9]. Their concentration in bile is also influenced by foodstuffs and liver affections[5]. Cholic acid[10], the origin of which is still problematical, is a factor determining the amount of bile acids which are excreted. The other portion of the bile acid molecule is derived from food and body protein[10]. The actual synthesis of bile acids probably occurs in the liver[10]. Relatively accurate methods for determining bile acids have been devised[11], but unfortunately the analyses reported for human bile have not been made by these methods. Cholesterol has attracted attention because, though its presence in the body is ubiquitous, its origin, usefulness and fate are largely problematical. Clinically it is of importance because it enters largely into the composition of gall stones. The lipids compose a larger percentage of bile than does cholesterol and approximate the bile salts in relative amount. Nevertheless, little is known about them. The amount of phosphorus present has been used as the index of the phospholipid content of bile. Phosphorus can be accurately determined and its estimation constitutes one of the few reliable analytical methods for bile. However, it may be questioned whether all the phosphorus in bile is present as phospholipid.

The above discussion epitomizes the knowledge concerning the partitioning of the organic constituents of bile and their metabolic significance. Perhaps less is known about the lipids, including those containing phosphorus, than of any other biliary constituent. This observation furnishes one reason for the present investigation of the lipid and phosphorus content of human bile.

TABLE I

COLLECTED DATA ON SOLID CONSTITUENTS OF HUMAN BILE
REPORTED AS GRAMS PER 1000 CC. OF BILE

Substance	Source of Bile					
	Gall Bladder			Fistula		
	Minimum	Maximum	Average	Average	Minimum	Maximum
Total solids	20.3	177.3	93.6	30.2	11.9	35.4
Inorganic solids	6.3	37.6	11.5	13.8	5.8	61.3
Bile acids	10.1	167.6	66.9	11.3	2.2	18.3
Mucin and pigments	2.3	44.4	22.1	5.6	1.3	11.1
Fats	0.1	16.3	6.6	2.2	0.1	6.9
Soaps	1.4	24.7	12.3	1.2	0.2	2.6
Lecithin	0.05	5.3	1.8	3.5	0.6	6.4
Cholesterol	0.06	9.9	4.0	1.2	0.5	2.6

Examination of the literature on analyses of human bile shows the reports of nine authors on gall bladder bile[12] and of eight on fistula bile[13] to be complete enough to permit comparisons of the results reported. Average figures for the various solid constituents together with the minimum and maximum amounts as reported for both gall bladder bile and those from fistula bile are given in Table I.

Comparison of the two sets of data shows that with but two exceptions the constituents of gall bladder bile are present in very much greater concentration than in fistula bile. The two exceptions were total inorganic acids and lecithin. Both the actual and relative amounts of inorganic solids were greater in fistula than in gall bladder bile; this suggests that a portion of them had been reabsorbed by the walls of the gall bladder. The larger amount of lecithin in fistula bile can only give cause for speculation. Another difference between the biles from the two sources is that the fats were nearly double the soaps in fistula bile while the reverse occurred in the gall bladder bile.

In a survey of the literature Fox[14] found that 77 analyses of fistula bile by 19 observers yielded an average of about two per cent for total solids. The average figure for total solids of 44 analyses of gall bladder bile by six observers was eleven per cent. He gives the average cholesterol figure for 100 determinations of gall bladder bile as 0.375 per cent with the extremes at 0.01 and 1.3 per cent. For fistula bile the average was 0.057 per cent, the extremes were 0.004 and 0.15 per cent. The figures of Fox confirm the greater concentration of total solids and cholesterol in gall bladder bile demonstrated by the findings outlined in Table I.

For the purposes of the present investigation total fatty acids and phosphorus were estimated by the analytical methods recently reported[15]. The fractioning of the soap, free fatty acid and fat of bile was accomplished by methods shortly to be reported. The human biles analyzed were derived from operative fistulae, from the excised gall bladder and from the duodenum by means of a tube. The first two specimens of bile, with one exception, were removed from diseased persons and the third was contaminated by materials from the pancreas and stomach and intestinal wall.

The average figure for the total fatty acids of nine specimens of fistula bile was 1.16 gm. per liter, the extremes were 1.97 and 0.64 gm. The average figure for ten specimens of gall bladder bile was 11.68 gm., the extremes were 1.00 and 34.85 gm. These figures confirm the greater average concentration of total fatty acids in gall bladder bile previously noted (Table I).

Results obtained from partitioning and estimating the fatty acids derived from organic and inorganic sources of the bile are outlined in Table II which follows:

TABLE II

TOTAL FATTY ACID FRACTION OF ORGANIC AND INORGANIC COMPOUNDS IN HUMAN BILE

REPORTED AS GRAMS PER 1000 CC. OF BILE

Specimen	Source of Bile	Source of Fatty Acids			
		Fat	Free Fatty Acid	Soap	Total Fatty Acids
1	Duodenum	0.21†	0.11†	1.37†	1.69†
2		0.13†	0.55†	0.13†	0.81†
3		0.15†	0.26†	0.11†	0.53†
4	Fistula	0.58*		0.22	0.80
5		1.03*		0.38	1.41
6		0.206	0.116	0.878	1.20
7		0.524†	0.146†	2.740†	3.40†
8		0.382†	0.060†	3.060†	3.50†
9	Gall bladder	0.67*		8.920	9.590
10		0.40*		12.570	12.970
11		0.132	0.405	0.933	1.470
12		0.250	0.320	1.450	2.020
13		0.352	0.293	0.352	0.996
14		1.330	1.440	13.400	16.200
15		2.030	2.320	30.500	34.850
16		0.840	3.410	8.130	12.380
17		0.420	0.720	1.670	3.810

*Fat plus free fatty acid.
†From specimen collected directly in alcohol.

The analytical results show that the fatty acids of bile occur in three forms, i.e., in the free state, as acid in organic combinations and as soap. Excepting specimen 13 the fatty acids derived from soaps of gall bladder bile were in excess. The excess was great in seven specimens (Nos. 9, 10, 12, 14, 15, 16), as it was also in one fistula specimen (No. 8) and in one duodenal (No. 1). The significance of these findings will be discussed later.

The amounts of organically and inorganically combined phosphorus were estimated in six specimens of fistula, six of duodenal and seven of gall bladder bile. The results obtained are outlined in Table III which follows:

TABLE III

ORGANIC AND INORGANIC PHOSPHORUS OF HUMAN BILE

Specimen	Source of Bile	Grams Phosphorus per 1000 cc. of Bile	
		Organic Source	Inorganic Source
1	Fistula	0.49	0.00
2		0.56	0.32
3		0.06	0.04
4		0.07	0.00
5		0.08	0.01
6		0.18*	0.03*
7	Duodenum	0.10	0.02
8		0.14	0.00
9		0.17	0.00
10		0.30	0.01
11		0.15	0.00
12		0.34*	0.03*
13	Gall bladder	0.55	0.07
14		0.18	0.15
15		0.06	0.01
16		0.95	0.11
17		1.62	0.02
18		0.79	0.10
19		0.27	0.08

*From specimen collected in alcohol.

The findings in Table III show that organically combined phosphorus is a constant constituent of bile. Inorganically combined phosphorus was demonstrated constantly only in gall bladder bile. Excepting fistula specimens 2 and 3 and gall bladder specimen 14 the amounts of inorganic phosphorus were of proportionately insignificant amounts. The amounts of organically combined phosphorus varied considerably in the specimens from different sources and in different specimens from the same source. In general the amounts found in duodenal and fistula bile were comparable, while greater concentrations were the rule in gall bladder biles. The average figure for the former was 0.21 gm., and for the latter 0.63 gm. These findings do not agree with those outlined on Table I. An explanation for this will be offered later.

DISCUSSION

The value of the analyses of bile reported in the literature depends on the accuracy with

which the various solid constituents could be determined. The total solids, inorganic substances and phosphorus, the latter assumptively an index to "lecithin", can all be determined accurately. However, combining the weights of mucin and pigments gives but little useful information. The figures for cholesterol with one exception and for fats, soaps and bile acids were all estimated by admittedly inaccurate methods[11]. For this reason the analyses of the organic constituents of bile as reported in the earlier literature furnish information of qualitative rather than quantitative value.

The present authors have developed methods for estimating the fat, soap and free fatty acids of bile expressed in terms of fatty acids; and also the phosphorus combined both organically and inorganically. A large amount of carefully controlled experimentation has demonstrated that the results obtained by these methods are reliable. By their use the occurrence in bile of soaps, fats and organically combined phosphorus has been confirmed and the presence of free fatty acids and of inorganically combined phosphorus demonstrated. The question arises as to the origin of the various compounds demonstrated. Presumably fats and organic compounds of phosphorus were secreted by the liver cells. However, the other compounds found might very well represent decomposition products of these two. Such changes could conceivably take place during the indefinite period of stay of bile in either the gall bladder or in the collection flask connected with a fistula. In order to obviate this possibility bile was collected from fistulae and from the duodenum directly into alcohol. Ether was then added and the technic of the various analytical methods performed. Such procedures eliminated, so far as is possible, chemical decomposition. In the specimens so collected free fatty acids, soaps and inorganic phosphorus as well as neutral fats and organic phosphorus were demonstrated. These findings indicate that all these substances were secreted as such by the liver cells. In the duodenal specimens it is admitted that bile and pancreatic juice were mixed in the duodenum before these materials came in contact with alcohol. However, the tip of the duodenal tube was just beyond the point of entrance of pancreatic juice and active peristalsis of this region of the gut prevents stasis of its contents. Thus the contact of bile and pancreatic juice before admixture with alcohol varied from a few seconds to not more than a minute. The fact that duodenal contents can stand for several hours at room temperature and not change the proportions of their lipid or phosphorus fractions makes it highly probable that chemical decomposition did not occur in the duodenal contents collected as described. For this reason the duodenal bile findings confirm those of the fistula specimens.

There is such variation in the amounts of all the different fractions of fatty acids as shown in Table II that in duodenal or fistula bile any one of them may be greater in individual specimens than in some collections of gall bladder bile. However, usually the amounts of these fractions are so much greater in gall bladder bile as to leave no doubt that as a rule they are much more concentrated in the gall bladder than in bile from other sources. These findings confirm those previously outlined in Table I. Studying the individual analyses shows the percentages of total fatty acids representing soaps to vary from 16 to 81 per cent in duodenal bile, from 18 to 87 per cent in fistula bile and from 35 to 96 per cent in gall bladder bile. The average percentage of soap in gall bladder bile (92%) is so much greater than that in duodenal and fistula biles (66%) as to suggest the formation of soaps during the stay of bile in the gall bladder.

The amounts of phosphorus from organic and inorganic sources were investigated. The average figures for the former in duodenal bile were 0.22 gm., in fistula bile 0.20 gm., and in gall bladder bile 0.63 gm. These findings show a much greater concentration of organic phosphorus, a probable index to the phospholipids, in bile from the gall bladder. This finding indicates that the organic phosphorus compounds are concentrated in the gall bladder, as would be anticipated. However, other observers have not found this to be the case as was noted for the findings outlined in Table I.

It will be seen that inorganic phosphorus was found constantly only in gall bladder bile. Two explanations for this finding are apparent. One is that during its stay in the gall bladder the bile may have become so concentrated as to accumulate a measurable concentration of an otherwise undetectable amount of inorganic phosphorus. The other possibility is that there is formation of inorganic phosphorus resulting from chemical decomposition. The possible formation of soaps previously discussed makes the latter explanation more tenable.

A legitimate objection to interpreting the results of analyses of fistula and gall bladder bile as representing normal conditions naturally arises because presumably all the subjects were diseased. However, specimens 7 and 8 of Table II and specimen 6 of Table III were obtained from the fistula of a subject whose gall bladder was histologically normal, whose liver showed no gross pathology and secreted a dark colored, normal appearing bile. The findings in these specimens indicate apparently that free fatty acids, soaps and inorganic phosphates, as well as fats and organic phosphorus compounds, are secreted by the liver.

SUMMARY

The presence in bile of free fatty acids and inorganic phosphate has been demonstrated, and

the occurrence of fats, soaps and organic phosphorus compounds has been confirmed. Evidence is presented that free fatty acids, soaps and inorganic phosphate are secreted as such by the liver cells. The greatest average concentrations of the various fractions of lipids and phosphorus compounds occur in gall bladder bile. The findings are suggestive but by no means conclusive that a part of the soaps and the inorganic phosphate are formed in the gall bladder. The findings in duodenal bile and fistula bile were comparable. For this reason apparently the experimental conditions were such that any action of lipase in duodenal bile was negligible.

REFERENCES

1 Hoppe-Seyler, Felix: Handbuch der Physiologisch—und Pathologisch—Chemischen Analyse für Aerzte und Studirende. Ed. 8. Berlin, 1929. P. 706. Ibid.: Ueber die Veränderungen des Blutes bei Verbrennungen der Haut. Ztschr. f. physiol. Chem. 5:1, 1881.

2 Marshall, É. K., Jr., and Davis, David M.: Urea: its distribution in and elimination from the body. J. Biol. Chem. 18:53, 1914.

3 Whipple, G. H.: The origin and significance of the constituents of the bile. Physiol. Rev. 2:440, 1922.

4 McClure, C. W., and Huntsinger, Mildred E.: Studies in liver function. VI. Quantitative methods for determining the cholesterol and the alcohol-soluble and insoluble bile pigments of the duodenal contents. Boston M. & S. J. 194:812 (May 6) 1926.

Hooper, C. W., and Whipple, G. H.: Bile pigment metabolism. I. Bile pigment output and diet studies. Am. J. Physiol. 40:332, 1916.

5 McClure, C. W.: The clinical application of the pathologic physiology of the external secretions of the liver and pancreas. Am. J. M. Sc. 176:309, 1928.

McClure, Charles W., and Huntsinger, Mildred E.: Pathologic-physiologic studies on changes in the external secretions of the pancreas and liver. New Eng. J. Med. 206:507 (Mar. 10) 1932.

6 Foster, M. G.; Hooper, C. W., and Whipple, G. H.: The metabolism of bile acids. IV. Endogenous and exogenous factors. J. Biol. Chem. 38:393, 1919. Ibid.: The metabolism of bile acids. V. Control of bile ingestion and food factors. J. Biol. Chem. 38:413, 1919.

7 Wieland, Heinrich, and Weil, Friedrich Josef: Untersuchungen über die Cholsäure. I. Mitteilung. Ztschr. f. physiol. Chem. 80:287, 1912.

8 Windaus, A., and Neukirchen, K.: Die Umwandlung des Cholesterins in Cholansäure. (28. Mitteilung über Cholesterin.) Ber. d. deutsch. chem. Gesellsch. 52²:1915, 1919.

9 Foster, M. G.; Hooper, C. W., and Whipple, G. H.: The metabolism of bile acids. III. Administration by stomach of bile, bile acids, taurine, and cholic acid to show the influence upon bile acid elimination. J. Biol. Chem. 38:379, 1919.

10 Foster, M. G.; Hooper, C. W., and Whipple, G. H.: The metabolism of bile acids. VI. Origin of taurocholic acid. J. Biol. Chem. 38:421, 1919.

11 Foster, M. G., and Hooper, C. W.: The metabolism of bile acids. I. A quantitative method for analysis of bile acids in dog's bile. J. Biol. Chem. 38:355, 1919.

12 Frerichs, F. T.: Untersuchungen über Galle in physiologischer und pathologischer Beziehung. Hannover, Hahn, 1845.

Gorup-Besanez, Eugen F. von: Untersuchungen über Galle. Ein Beitrag zur physiologischen und pathologischen Chemie. Erlangen, F. Enke, 1846.

Ranke, Johannes: Die Blutvertheilung und der Thätigkeitswechsel der Organe. Leipzig, 1871.

Jacobsen, Oscar: Untersuchung menschlischer Galle. Ber. d. deutsch. chem. Gesellsch. 6²:1026, 1873.

Trifanovsky, D.: Ueber die Zusammensetzung der menschlichen Galle. Arch. f. d. ges. Physiol. 9:492, 1874.

Socoloff, N.: Beiträge zur Kenntniss der menschlichen Galle. Arch. f. d. ges. Physiol. 12:54, 1876.

Birch, De Burgh, and Spong, Harry: The secretion of the gall bladder. J. Physiol. 8:378, 1887.

Baginsky, A., and Sommerfeld, P.: Zur Chemie der kindlichen Galle. Arch. f. Kinderh. 19:321, 1895-1896.

Brand, J.: Untersuchungen über die Ausscheidung und Zusammensetzung der Galle beim Menschen. Jahresb. f. Tierchem (Maly). 31:547, 1901.

13 Yeo, Gerald F., and Herroun, E. F.: A note on the composition of human bile obtained from a fistula. J. Physiol. 5:116, 1884.

Copeman, S. Monckton, and Winston, W. B.: Observations on human bile obtained from a case of biliary fistula. J. Physiol. 10:213, 1889.

Robson, A. W. M.: Observations on the secretion of bile in a case of biliary fistula. Proc. Roy. Soc. Lond. 47:499, 1889-1890.

Paton, D. Nöel, and Balfour, John M.: On the composition, flow, and physiological action of the bile in man. Lab. Reports Roy. Col. Phys. 3:191, 1891.

Majewski, F., and Zebrowski, B.: Ein Beitrag zur Kenntnis der chemischen. Zusammensetzung der menschlichen Galle. Jahresb. f. Tierchem (Maly). 32:508, 1902.

Bonanni, A.: Beitrag zur Kenntnis der menschlichen Galle. Jahresb. f. Tierchem (Maly). 32:508, 1902.

Menzies, J. A.: Observations on the secretion and composition of human bile. Biochem. J. 6:210, 1911-1912.

Rosenbloom, Jacob: A quantitative chemical analysis of human bile. J. Biol. Chem. 14:241, 1913.

14 Fox, F. W.: The composition of human bile and its bearing upon sterol metabolism. Quart. J. Med. 21: 107, 1927-1928.

15 McClure, Charles W.; Huntsinger, Mildred E., and Bloomberg, Esther: Studies in fat metabolism. III. New procedure for the isolation and quantitation of the total fatty acids in small amounts of bile. New Eng. J. Med. 204:764 (Apr. 9) 1931.

16 McClure, Charles W.; Bloomberg, Esther L., and Huntsinger, Mildred E.: Studies in fat metabolism. IV. New procedures for quantitating the organic phosphorus in small amounts of bile. New Eng. J. Med. 204:1091 (May 21) 1931.

PAROXYSMAL HEMOGLOBINURIA*

Report of Cases, With Familial Findings

BY FRANCIS P. MC CARTHY, M.D.,† AND ROBERT WILSON, JR., M.D.†

OF the many manifestations of late congenital and acquired syphilis, one of the most striking, and probably often overlooked, is the syndrome of paroxysmal hemoglobinuria. In the department for the treatment of syphilis at the Boston City Hospital, 3368 cases have been under observation and treatment during the past 11 years. This group includes 1258 primary and secondary cases, in which paroxysmal hemoglobinuria would not be expected to occur, 1899 tertiary and 211 congenital syphilitics. One of the cases presented below is the first in which this condition has been recognized for at least twenty years, during eleven of which, 2110 late and congenital cases have been observed. The rarity of the disease as indicated by these figures is substantiated by the fact that a total of less than 300 cases is reported in the literature, and because of this, two new cases are herewith presented, both with some unusual and interesting features. In one of these cases, the congenital syphilitic, a familial tendency was shown by the demonstration of a positive Donath and Landsteiner phenomenon in the blood serum of two younger sisters.

In recent monographs, Mackenzie[1] in this

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country and Cattaneo[2] in Italy have brought the subject of paroxysmal hemoglobinuria up to date, with complete reviews and bibliographies, and to attempt more than a cursory summary would be superfluous. It is our desire merely to indicate briefly some of the most important and interesting features of this condition, especially in relation to our cases.

To define the disease, paroxysmal hemoglobinuria is a condition characterized by the transitory occurrence of hemoglobin in the urine following local or general exposure to cold, due to the presence in the blood serum of autohemolysins capable of hemolytic action on the red blood cells sufficient to produce the phenomena of hemoglobinemia and hemoglobinuria; associated are more or less typical prodromal constitutional symptoms. Its definite relationship to late syphilis has been well established, and it is perhaps more common in congenital syphilities than in patients with the acquired form of the disease; in the latter group those patients who develop this condition are usually inadequately treated or untreated cases. The autohemolysin characteristic of the disease is present in a small percentage of late syphilities who have had none of the typical clinical symptoms of hemoglobinuria, as has been proved by serologic tests.

The passage of "bloody urine" is usually the symptom that brings the patient to the physician. The relation of attacks to previous chilling may or may not have been noted, but prodromal symptoms are often described; chilliness, malaise, pains in the muscles of the back, legs or abdomen, and paresthesias of different parts of the body are the most common. Almost immediately there is an abrupt rise in temperature to 101°-103°, and after a short time, a desire to urinate and the passage of dark red urine. The color commonly persists in the first two specimens and then entirely disappears. The temperature falls, recovery is complete, and there are no symptoms between attacks, but if a large amount of hemoglobin has been liberated and excreted, there may be a mild icterus of short duration and symptoms of weakness and lassitude from the ensuing secondary anemia. Incomplete attacks have been described under various names, either in which hemoglobinuria appears without warning, or the reverse, where there are the characteristic prodromal symptoms without the passage of hemoglobin in the urine, but the typical attack is most common.

The essential laboratory findings in the disease are associated with the changes in the urine and blood. Between attacks the urine is ordinarily entirely normal; during the paroxysm the urine is reddened, albumin is found, a few red blood cells may be present, a few casts, and hemoglobin, usually in a reduced form, is readily demonstrated by spectroscopic examination. The cellular elements of the blood likewise show changes during and following paroxysm; the red cell count may fall by as many as a million cells per cu. mm.; the hemoglobin falls rapidly; there is at first a transitory leucocytosis, followed by a leucopenia with relative lymphocytosis. For a short time after the attack there may be a slight rise in the icteric index; this rapidly falls to normal with the prompt physiological activity of the liver and kidneys. The fragility of the red cells is usually normal. The presence of auto and iso-hemolysins in the blood serum is pathognomonic and laboratory tests for their demonstration are discussed below.

SEROLOGY

The serological picture of paroxysmal hemoglobinuria is striking and is confined to this form only, readily differentiating this condition and other forms of hemoglobinuria.

An autohemolysin activated by exposure of the patient to local or general cold is responsible for the phenomena found in this disease. Apparently no other factor plays a rôle in the precipitation of an attack than the exposure to cold.

The serology of the disease was first brought to light by Donath and Landsteiner by the demonstration in vitro of the autohemolysin present in the blood serum of a group of cases.

The serological test, the Donath-Landsteiner reaction, may be carried out very simply by mixing 1 cc. of serum or plasma with 0.5 cc. of a 10% or 20% suspension of normal red blood cells in salt solution, chilling the mixture for 10 minutes and then bringing it up to body temperature in the incubator. This should not take more than one-half hour. Definite hemolysis in the supernatant fluid is noted after centrifugalization, while in the control group, similar mixtures, which have not been previously cooled or in which normal serum was used, there is no hemolysis.

The exhaustion of the complement in the patient's serum by previous frequent attacks occasionally occurs. Activation of the blood serum by adding up to 0.25 cc. of fresh guinea-pig serum to 0.5 to 1 cc. of human serum will result in a positive test in the cooled tube. The diminution of complement, due to adsorption by the autohemolysins in previous attacks, is undoubtedly the factor in reducing the number of attacks in many cases.

The genesis of the autohemolysin present in the blood serum of patients with this disease is not entirely clear, but the demonstration of the production of an autohemolysin in the serum of rabbits following the injection of certain organ emulsions suggests that an endotoxin of the body of the spirochete and not a toxin liberated by it is the essential etiological factor. (Namba[3].) In reviewing 207 cases of this condition, Burmeister[4] found that the Wassermann

reaction was positive in 95% of the cases in which it was reported; it is suggested here that in the few remaining cases the hemolysis which would give a negative reading in the performance of the complement-fixation test was brought about by the presence of the iso-hemolysins in the serum, and if these had been previously separated out or if a precipitin test had been carried out, these cases would likewise have shown serological evidence of syphilis.

The clinical test for the artificial production of an attack, the Rosenbach test, which was tried in both of our cases, consists of immersing the patient's feet in ice cold water for about ten minutes to reproduce the symptoms of the disease with or without hemoglobinuria. This test was positive in one of our cases and for obvious reasons was negative in the other. As in the Donath-Landsteiner test both of these tests may be negative due to the exhaustion of the blood complement from previous attacks (Meyer and Emmerich[5]) or from antiluetic treatment (Kumagai and Namba[6]).

One observer[7] reports that the injection of casein resulted in an attack, but there is no other reference in the literature to any factor, other than exposure to cold, capable of producing an attack. In one of our cases neither the injection of aolin intramuscularly nor typhoid vaccine intravenously resulted in the production of hemoglobin in the urine, although following the latter the patient had a moderately severe reaction with chills and high temperature.

CASE No. 1: C. G. Single. Aged 23 years. Negro, cook. Admitted to Boston City Hospital, November 20, 1931.

Family History: Essentially negative.

Past History: Primary chancre at the age of 17.

C. C.: "Bloody urine."

Present Illness: The patient states that he has had attacks of "bloody urine" for the past two years. The first attack took place about two years ago, and he has had attacks at irregular intervals ever since; he thinks he has had a total of about 12 such attacks. He describes the attack as beginning with a feeling of numbness and tingling in the chest and back; then he will have either moderate chilly sensations or a severe shaking chill, with considerable fever; following this, a desire to urinate comes on, and there is the passage of bright red urine. The color persists in two specimens of urine and then completely clears. He has noted no relation to chilling just prior to the attack; they come on in the summer as well as in winter, and he says that he had an attack the night before admission.

The patient had been in the hospital on the Surgical service a month previously, with the chief complaint of pain in the back in addition to "bloody urine". At this time a diagnosis of paroxysmal hemoglobinuria was suggested but no laboratory work carried out to prove it.

Physical Examination: Essentially negative.

Laboratory Examination: The urine on admission was negative except for the presence of an occasional red cell and granular cast in the centrifuged sediment. Blood counts showed a slight secondary anemia, with 66 per cent hemoglobin and 4,370,000 red cells. The icteric index was 13, the patient having had an attack the night previous to admission. Blood Wassermann and Kahn were both strongly positive. The Rosenbach phenomenon was demonstrated the day after admission, immersion of the feet in iced water resulting in a typical attack of hemoglobinuria. The Donath and Landsteiner reaction in the blood serum readily demonstrated the presence of both iso- and auto-hemolysins. Kidney function was essentially normal. The specific gravity of the urine was high, the N. P. N. 26, and Urea Clearance of 79 per cent. Fragility test showed a very slight increase in the resistance of the red cells to hypertonic salt solution, definite hemolysis beginning at 0.42. Complete hemolysis at 0.12.

During the course of the patient's stay in the hospital, he had one spontaneous attack of hemoglobinuria, preceded by the typical prodromal symptoms; he was in bed in a heated ward at this time, and no history of previous chilling could be found to account for its occurrence. On a number of occasions he complained of chilliness and paresthesias, without hemoglobinuria, these being abortive attacks without question. Aolin intramuscularly and typhoid vaccine by vein, the latter resulting in chills and fever, both failed to bring on hemoglobinuria. Specific treatment with neoarsphenamine was begun, the patient receiving five injections for a total 1.95 G, before discharge. He reappeared at the hospital three hours after he left, having had another typical attack, and was readmitted, but there have been no subsequent attacks.

Comment: The most unusual feature of this case is the fact that spontaneous attacks of hemoglobinuria began only four years after the initial lesion of syphilis, at the age of 21. He was observed in one spontaneous attack while in bed in the hospital, without demonstrable chilling previously, and neither in this attack nor in the one induced by artificial chilling was there any rise in temperature. The slight but definite increase in the resistance of the red cells to hypotonic salt solution is likewise of interest, the fragility test having been reported normal in all of the cases where it has been done.

CASE No. 2: C. W. Aged five years and ten months.

Family History: Mother was admitted under treatment for lues, an untreated case, probably contracted from husband although his Wassermann is negative. Two younger children, ages three years, and twenty months.

Past History: Measles at two years of age. No other children's diseases. Bronchial pneumonia at two months. Subject to bronchial asthma for past one year, with attacks about once a week. Has been under treatment for "spinal trouble" by orthopedic doctor since two years of age. Treated by urologist for obscure urinary trouble, called it hematuria, but the diagnosis was not definitely made even after hospitalization. Attack of interstitial keratitis in May, 1931—still under treatment. Wearing glasses for one year prior to attack. Diagnosis of congenital lues made for the first time in May, 1931, following the attack of interstitial keratitis.

Present Illness: This history obtained from the mother after treatment was started. At the age of 19 months, the mother first noticed a dark "bloody urine" which occurred at intervals up to the beginning of antiluetic treatment in June, 1931. She noticed that the attacks were preceded by chill followed by sleepiness and prostration. She passed a "bloody urine" for a period as long as 48 hours. The bad attacks occurred between the ages of two and four

years. During the summer the attacks would not occur or she would have a rare attack. During the winter they would occur once a month or more often. The mother noticed that the attacks followed exposure to cold. The patient was treated by the family doctor, who advised against exposure to cold. She has been under treatment since June, 1931, and no attacks of hemoglobinuria have occurred since. In November she had a chill, but no hemoglobinuria. The serum reaction of the blood was positive for autohemolysin on December 8, 1931. The patient was under observation in a hospital for two weeks in February, 1929, but no attack occurred as the patient was kept in bed and there was no exposure to cold.

A Wassermann test was taken in May, 1931, and found to be positive. The patient has received 25 doses of neoarsphenamine .15 since treatment was begun and there has been a marked improvement in the keratitis and spinal condition and a gain of weight of about seven pounds. There have been no spontaneous attacks since the patient has been under treatment, and the artificial clinical test (Rosenbach) was negative.

Familial Findings: The two younger children, ages respectively 3 years and 20 months, were examined for evidences of congenital syphilis and serological tests of their blood, by the Wassermann, and Donath and Landsteiner tests.

The Wassermann tests were negative in both children but the tests for auto hemolysins were both strikingly positive.

The younger child has, since the advent of cold weather according to the mother's observation, shown symptoms strongly suggestive of those which are usually associated with an attack of paroxysmal hemoglobinuria. Following exposure to the cold she has symptoms of a slight chill, becomes very irritable, and cries for a period of a few minutes; no signs of any changes in the urine have been found, however. The older child shows widely separated upper central and lateral teeth with marked hypoplasia, but no other definite stigmata of the disease.

An examination of the mother's blood showed a negative Donath-Landsteiner test. This test was not done, however, until after she had fairly intensive arsenical and bismuth therapy resulting in the production of a negative Wassermann and Kahn test.

Comment: This case is of particular interest because of the positive serological tests in other members of the patient's family, in spite of negative Wassermann reactions, corresponding to the findings in one of the cases recently reported by Thurmon and Blain[8]. The prompt disappearance of spontaneous attacks after the beginning of antiluetic treatment is also quite striking.

Summary: Two cases of paroxysmal hemoglobinuria, one early acquired and the other an early congenital case, are reported.

In the congenital case the familial findings of positive Donath-Landsteiner reactions with negative Wassermann findings are of particular interest.

REFERENCES

1 Mackenzie, G. M.: Paroxysmal hemoglobinuria, a review. Medicine. 8: 159 (May) 1929.
2 Cattaneo, Luigi: Emoglobinuria Parossistica a Frigore. Gior. Ital. di dermat. e sifil. 72: 1159, 1931.
3 Namba, M.: Ueber die Künstliche Erzeugung des Autohämolysins. Deutsche med Wchnschr. 51[1]: 594, 1925.
4 Burmeister, J.: Über paroxysmale Hämoglobinurie und Syphilis; zugleich ein Beitrag zum Problem der Erkältungskrankheiten. Ztschr. f. klin. Med. 92: 19 (Nov.) 1921.
5 Meyer, E., and Emmerich, E.: Über paroxysmale Hämoglobinurie. Deutsches Arch. f. klin. Med. 96: 287, 1909.
6 Kumagai, T., and Namba, M.: Weitere Beiträge zur Kenntnis der paroxysmalen Hämoglobinurie. Deutsches Arch. f. klin. Med. 156: 257, 1927.
7 Roch, Leingme, A.: Paroxysmal hemoglobinuria provoked by chilling and by intravenous injection of casein. Bull. et mém. Soc. méd. d. hôp. de Paris. 46: 1737, 1922.
8 Thurmon, F., and Blain, D.: Paroxysmal hemoglobinuria; observation based upon a study of three cases. Am. J. Syph. 15: 350 (July) 1931.

THE PROBLEM OF THE DEAF-BLIND

In the United States a research has disclosed the fact that there are 887 deaf-blind persons in this country and 57 in Canada. This class is regarded as not only the most heavily handicapped and the most lonely of human beings but also the most neglected, according to Miss Corinne Rocheleau Rouleau who is engaged in this study. One great difficulty in dealing with the deaf-blind is the inability to apply intelligence tests in order to qualify these unfortunate persons for certain resources in the way of education. Of the cases discovered most are white persons, although a number of Negroes have been found and one Indian. Of these people many are maimed as well as deaf and blind. A few are war veterans. Their method of communicating with each other is by the Braille system and it is through this system that much of the education has been carried on. Efforts are being made along the same line in London, Paris, Berlin and Montreal, according to Mrs. Rouleau, who adds, "We hope that all these things and more will be done for our American cases through the well-directed efforts of a central committee for the deaf-blind."

THE IMPORTANCE OF PROPER DIET AS A PREVENTIVE OF EYE DISEASES

Dr. Park Lewis of Buffalo, New York, Vice-President of the National Society for the Prevention of Blindness, sets forth in a recent issue of the Society's quarterly bulletin "*The Sight-Saving Review*" that faulty diet may lead to serious eye maladies. He points out that vitamin A has a very important effect in maintaining the normal functions of the eye and that the absence of this important substance often causes night blindness which is in itself a contributive factor in liability to accidents.

AN IMPROPER REMEDY FOR DIABETES

According to the report of the Department of Agriculture, Charles F. Diller, trading as the Photo-Synthetic Tea Company, Lancaster, Pa., has been fined $25. He claims that this photo-synthetic tea is a relief for diabetes and anemia and further that it makes the sugar normal and the blood red. This brings to mind the fact that the Government has removed from interstate commerce another of the very many alleged remedies which have been exploited as useful in the treatment of diabetes.

NEW HAMPSHIRE MEDICAL SOCIETY

ROENTGEN RAYS IN THE DIAGNOSIS OF EARLY PULMONARY TUBERCULOSIS*

BY B. R. KIRKLIN, M.D.†

ALTHOUGH for many years a subject of controversy, the value of roentgen rays in the diagnosis of early pulmonary tuberculosis is no longer debatable. It is rare that roentgenologic signs are not discernible in cases of tuberculosis with suggestive clinical manifestations, but the converse occurs far more often, and cases without number can be cited in which the disease was revealed and identified by means of roentgen rays when clinical symptoms and signs were vague, trivial or absent. Sampson and Brown have encountered a surprisingly large number of cases in which definite changes, characteristic of tuberculosis, were visible in the roentgenogram long before definitely abnormal physical signs could be detected. They stated specifically that among more than 1,300 consecutive cases observed at Trudeau, the physical signs in 32 per cent were either absent or so slight that the diagnosis was established entirely or in large part from study of the roentgenograms.

Results such as these, of course, depend on appropriate technical methods, adequate experience in interpretation, and familiarity with normal conditions which are highly variable. In earlier days prejudice was aroused by the tendency to make roentgenologic diagnoses of tuberculosis in healthy persons. This is a natural inclination of the beginner, who is likely to regard with suspicion even the normal markings of the lung, and who commonly fails to realize that traces of former pulmonary disease, which can be found in examination of almost all persons, must not be construed as indicative of clinical tuberculosis. With reference to technic, it need only be said here that roentgenoscopy is not sufficient for the discovery or exclusion of early tuberculosis, and that roentgenography, preferably stereoscopic and rapid, is essential. With a suitable method of examination, which is easily available, due regard for elementary principles of interpretation, and active coöperation between roentgenologist and clinician, few cases of early tuberculosis will escape recognition, and few errors on the affirmative side will occur.

Virtually all cases of tuberculosis among adult subjects may be classed in two groups. In the first group of cases, which is by far the most numerous, the earliest significant manifestation is a faint shadow in an upper lobe, more often that of the right lung. When viewed stereoscopically the slight opacity is more or less conical; in the single roentgenogram it appears to be somewhat fan-shaped. The base of the shadow is at the periphery of the lung and is often directed toward the axilla; its apex points toward the hilum. It lies obliquely below the clavicle, usually in the first or second interspace, and its long axis corresponds to an external twig of the ascending branch of the main bronchus. Especially notable is the faint and gauze-like appearance of the shadow, which on close scrutiny, is seen to be composed of a tangled reticulum of delicate lines enveloped in a filmy veil. Its appearance has been compared aptly to that of a caterpillar's web on an outer branch of a tree, or to a wisp of drifting fog (fig. 1).

FIG. 1. Triangular shadow in left infraclavicular region; early tuberculosis.

In the second group the lesions are likewise situated in the outer parenchyma of the lung and below the clavicle, but are more or less spherical in form. In most instances they are multiple, but they may occur singly. When

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multiple they are grouped in varying degrees of proximity to one another and may be plainly discrete or apparently confluent. Their diameter varies from 1 or 2 mm. to several centimeters, and multiple foci usually differ markedly in size. As in the first group, a striking and significant characteristic of the shadows is their faintness, although they are appreciably denser at the center than at the circumference, the latter being quite indistinct (fig. 2).

FIG. 2. Nodular type of early tuberculosis, left lung.

Certain features are common to both groups. Most important is accentuation of the bronchovascular trunk leading from the affected region to the hilum. In some instances the ribs on the affected side descend more steeply, with consequent narrowing of the intercostal spaces, but this phenomenon is more often associated with advanced disease. Occasionally the unaffected lung appears to be brighter than normal, but this also is more commonly compensatory to advanced disease.

On roentgenoscopic examination, elevation and restricted movement of the diaphragm on the diseased side are likely to be noted, and the elevation may be apparent in the roentgenogram. Usually the chief quest on the screen is for a shaded apex which fails to light up on forced inspiration or on coughing. However, elevation of the diaphragm is often more apparent than real, restriction of its movement occurs in many diseases other than tuberculosis, and apical darkening not only has other pathologic causes but is often the result of inequalities in the musculature of the neck and shoulder girdle, or due to technical factors. Contrary to former belief, lesions in the apical field above the clavicle are seldom observed in really early tuberculosis; when they are present the disease almost invariably is well advanced, and then the lesions below the clavicle are more striking than those above. Confident and consistent revelation or exclusion of really early lesions by means of the screen alone is as yet impossible, and the supplementary information which it may yield in these cases is so trivial and indecisive, that few roentgenologists employ roentgenoscopy in this connection.

The differential diagnosis of early tuberculosis is not often difficult if its four salient characteristics are kept constantly in mind. These are as follows: (1) its situation below the clavicle and in the peripheral part of the parenchyma of an upper lobe; (2) the roughly conical or spherical form of the lesions; (3) the hazy faintness and marginal dimness of the shadows, which merge indefinably with the transradiant normal tissue, and (4) the enlargement of the tributary bronchovascular stem. The combination of all these traits is essential for identification of the disease, and few of its simulants have all of them. Among simulants which may come into consideration are the lateral border of an azygos lobe, bronchiectasis, metastatic growths, shadows from extraneous sources, emphasized bronchovascular markings without related shadows in the parenchyma, simple localized pneumonitis, and small, arrested foci of tuberculosis.

Although not common, an azygos lobe in the upper mesial portion of the right lung is not extremely rare. The pleural surface of its lateral border is depicted by a well-defined curving shadow which resembles a long inverted comma. Because of its situation and comparatively uncommon occurrence, the shadow might be mistaken for that of tuberculosis, but other characteristics of the disease, indispensable in diagnosis, are absent.

Bronchiectasis in an upper lobe appears as an irregular, pyramidal, mottled shadow, the apex of which points toward the hilum. Although the corresponding alveoli may be atelectatic and hazy, the more striking shadows are relatively dense and central rather than peripheral. Further, bronchiectasis rather seldom affects upper bronchi, and if it does, is likely to be the result of healed tuberculosis.

Occasionally a single malignant metastatic nodule in the infraclavicular region has some resemblance to an early conglomerate tubercle. However, metastatic nodules are commonly denser, more regularly spherical and more sharply defined than conglomerate tubercles, and when discovered, are usually numerous and scattered throughout several lobes.

Women are sometimes allowed to wear, during the process of roentgenography, a cape or other covering which may produce a hazy shadow

below the clavicle. Caseous or calcified supraclavicular lymph nodes, or cutaneous lesions may also produce shadows over the upper field of a lung. In these and similar instances the stereoscopic view will usually suffice to exclude intrapulmonary disease.

At one time it was widely believed that tuberculosis of adults arose by reactivation of the primary infection acquired in childhood, with retrogression from the affected mediastinal lymph nodes through the tributary lymph vessels into the pulmonary parenchyma. Consequently intensification of the hilar shadow and of the principal vascular markings, with or without so-called beading of the trunks, was considered by many roentgenologists a sufficient basis for the diagnosis of tuberculosis. In due course, however, it was noted that among patients with such manifestations clinical tuberculosis rarely developed, and that these appearances were often found in obviously healthy persons. Notwithstanding these facts the hypothesis was only slowly abandoned, and for a long time thereafter the phrase "peribronchial thickening" was used to describe the condition, but this term is ambiguous, of doubtful applicability to the morbid anatomy, and rapidly becoming obsolete. Certainly, accentuation of radicular markings without changes in the corresponding outer parts of the parenchyma is an extremely hazardous basis for the diagnosis of tuberculosis.

Colds and other ordinary pulmonary infections often give rise to localized pneumonitis which, if situated in the infraclavicular region, may be indistinguishable from incipient tuberculosis. Pneumonitis may be manifested as a gauzy conical shadow, probably produced largely by congestion, or as a small, mottled patch representing restricted bronchopneumonia. The situation, haziness and indefinite margins of the shadows, together with the accompanying exaggeration of the corresponding vascular markings, make the total picture identical with that of one or the other types of early tuberculosis, and the roentgenologist will be constrained to make the latter diagnosis, at least tentatively. In such cases the clinician can forestall error by deferring final judgment, examining the sputum frequently, and sending the patient for reëxamination later. It is fortunate that simple pulmonary infections seldom affect more than the upper portion of an upper lobe, but the possibility of this event should not be forgotten, especially when colds, pneumonia or influenza are epidemic.

Small healed or well arrested tuberculous lesions are often found in adults. Most healed lesions are dense, sharply set off from the normal tissue, and frequently accompanied by calcified lymph nodes at the hilum or elsewhere (fig. 3). Often the adjacent pleura is plainly thickened. In contrast, early active lesions produce thin shadows with vague, indefinable margins, and they are rarely associated with calcified lymph nodes or dense interlobar thickening. With flawless technic and fairly extensive experience, the examiner should seldom err in distinguishing between healed and active lesions.

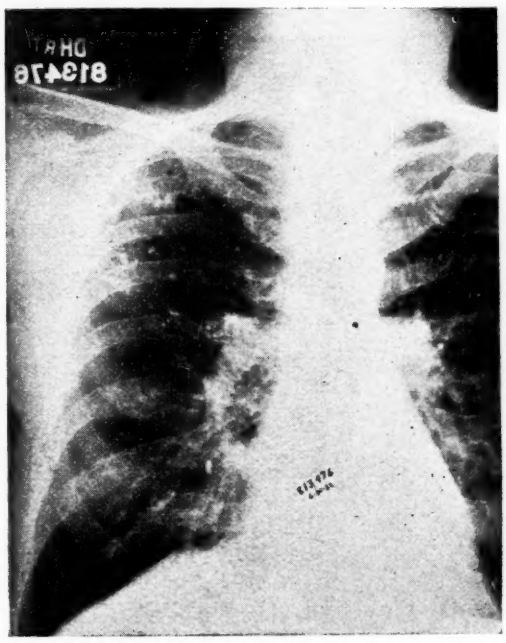

FIG. 3. Small, healed tuberculous lesions in upper portion of right lung.

It is imperative that the technic be exact and appropriate, for apparent perifocal haziness may be the result of movement, and the density of the shadows will vary somewhat with the distance of the lesions from the film and the quality of the rays. Although such factors of error should be obvious, the examiner may be deceived occasionally by them, and for this reason the roentgenologist's opinion should always be subject to clinical review. As a single test of activity the roentgenologic examination is probably equal to any other, but no single test is a sufficient basis for such a momentous decision. Further, patients with identical roentgenologic evidence of activity may not present identical clinical problems. Marginal haziness undoubtedly represents reactive congestion and inflammation about the lesion, and is thus a reliable criterion from the standpoint of morbid anatomy (fig. 4). However, of two patients bearing this stigma, one may be clinically normal, the other manifestly ill, depending on the balance or imbalance between reaction and disease. Quite properly, the clinical treatment of the two patients may vary accordingly. Nevertheless, the roentgenologic mark of activity can never be safely ignored. For these reasons, coöperation and mutual understanding between

roentgenologist and clinician should be intimate and thorough.

Exceptionally, adults are attacked by primary tuberculosis, like that which attacks children, and with similar roentgenologic phenomena. A lower lobe or the circumhilar region may be affected, and, although the manifestations are obvious, the roentgenologist can-

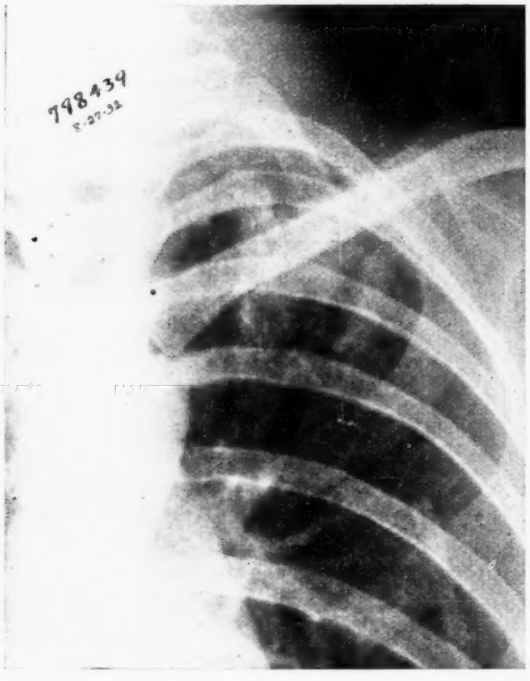

FIG. 4. Soft, hazily defined lesion in left apex and below clavicle, characteristic of early tuberculosis. This patient had no physical signs of the disease.

not consistently attribute them to tuberculosis, for the presumption is strong that they are due to some other disease. In most cases the appearance resembles that of bronchopneumonia and is likely to be so interpreted. As the symptoms and physical signs are also atypical, diagnosis in these cases usually requires combined and prolonged clinical and roentgenologic study.

Primary tuberculosis of children differs in many respects from the secondary form common among adults. When puberty is reached, almost all children have been infected with the bacillus of tuberculosis, and it is generally accepted that the initial pulmonary lesion is in the parenchyma rather than the lymph nodes, although the latter react most conspicuously. In a majority of cases the initial lesion is arrested, but it may extend to produce clinically important primary tuberculosis. Occasionally, also, after subsidence of the initial infection, children develop secondary tuberculosis similar to that of adults.

Since primary infection of children is the rule, its confirmation by roentgen rays in a given instance, if possible, would scarcely be necessary. Often mediastinal lymphadenopathy is pronounced; the median shadow is greatly widened, its borders may be polycyclic, and the larger vascular markings may seem to be accentuated. The Ghon focus, which is small, usually single, and situated in the parenchyma of any lobe, may be visible as a somewhat rounded, fan-like or irregularly shaped shadow. However, the mediastinal shadow commonly is wide in children, and it may be greatly enlarged for many weeks after measles, whooping cough or other infectious diseases. Identification of a particular parenchymal shadow as that of a Ghon focus is necessarily uncertain. Hence, although the roentgenologic picture may give assistance, the problem of primary infection is chiefly clinical.

When the infection has produced grave parenchymal disease, the manifestations are more striking but still difficult to interpret. The focal lesion may be situated in any of the lobes, but it has a predilection for the lower portion of the lobe invaded, or for the circumhilar region. Its shadow may be fan-shaped or irregular, and at first is homogeneous with the appearance of ground glass, later becoming mottled (fig. 5). In

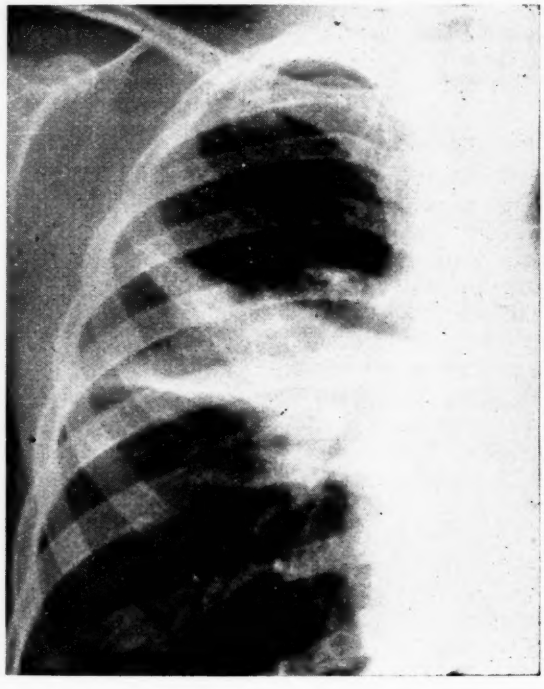

FIG. 5. Primary tuberculous pneumonitis in a child, discovered at routine examination of the lungs preliminary to tonsillectomy. The Mantoux test was strongly positive. At all times the physical examination has been negative.

addition the median shadow is widened, and the radicular markings are accentuated. But the entire picture cannot be distinguished with certainty from that of bronchopneumonia or lobar pneumonia, and final diagnosis must be left to the clinician.

Since miliary tuberculosis of the lungs sometimes originates in small foci the existence of

which is unsuspected, it must under such circumstances be included among early forms of the disease. Its clinical recognition without knowledge of a primary focus is almost impossible, but roentgen rays will usually reveal and identify the condition. In its earliest stages, only a general veiling of the pulmonary fields may be apparent, but soon the tubercles become visible as myriad minute flecks scattered over both lungs. The appearance of the pulmonary shadow has been described as granular, stippled, marbled, or mottled, or compared to that of a snowstorm. To me it seems to resemble a sponge, the texture of which varies from exceedingly fine to moderately coarse (fig. 6).

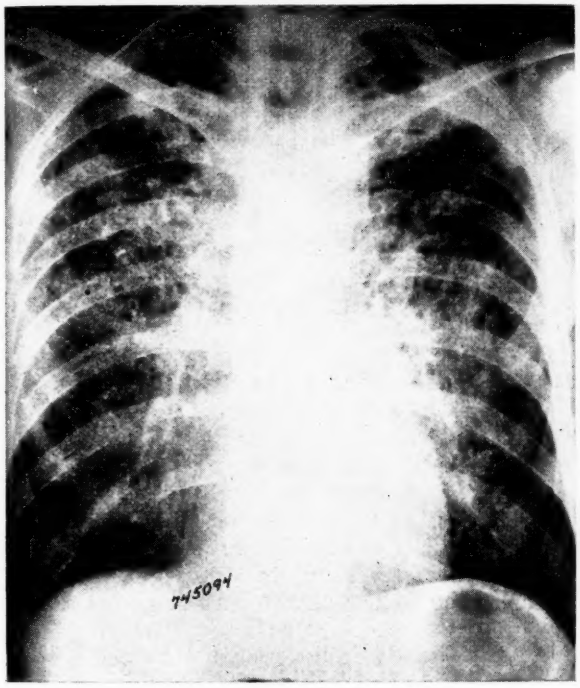

FIG. 6. Fairly advanced miliary tuberculosis.

The entire roentgenologic picture of miliary tuberculosis is almost pathognomonic but dependence on the roentgen rays cannot be absolute, for miliary metastasis or pneumoconiosis, particularly that produced by organic dusts, may imitate the disease. Principal marks of distinction are the following: Miliary metastatic lesions are diverse in size, denser than miliary tubercles, and have a preference for the lower two-thirds of the lung. Pneumoconiosis usually spares the apexes and is most marked about the hilum; the individual lesions are commonly more irregular in size and shape, larger and denser than miliary tubercles. Hence the roentgenologic differential diagnosis is most often correct, but it would be unjust to the patient to dispense with clinical sanction.

In conclusion, it may be asserted confidently that without the employment, as a routine, of roentgen rays, many, if not most, of the truly early cases of pulmonary tuberculosis will escape recognition. As a single rapid method for definite revelation of the lesion, the determination of its probable nature and even the estimation of its activity, I do not believe that the roentgenologic examination is surpassed by any other. But the method also has its limitations and is easily susceptible of abuse by the inexperienced and incautious, who are prone to regard every adventitious shadow as an indication of tuberculosis. On the other hand, the clinician is often handicapped by the failure of early tuberculosis to express itself in diagnostic clinical manifestations. It follows then, that the roentgenologic data should always be correlated with the clinical facts, for the two methods of examination are interdependent and indispensable to each other.

REFERENCE

1 Sampson, H. L. and Brown, Lawrason: The value of the roentgenologic examination in pulmonary tuberculosis. Am. Jour. Roentgenol. and Radium Therap. 25:209-219 (Feb.) 1931.

Discussion

Dr. Fred S. Eveleth, Concord: Dr. Kirklin has given us a very comprehensive and correct approach to the diagnosis of minimum pulmonary tuberculosis.

No doubt the stereoscopic view of the chest is the ideal method of x-ray examination of an incipient tuberculous lesion. To those who have not the most modern stereoscopic shift and speed control, a front and back roentgenogram in the correct position with short exposure will give good results, but will not give the conical or spherical form of the lesion as stated in the differential diagnosis.

With the modern equipments and greater experience in the interpretation of roentgenograms, the x-ray examination has taken the lead in the early diagnosis of pulmonary tuberculosis.

When the National Tuberculosis Association makes the statement that tuberculosis is the chief destroyer of life during the first decade of maturity, that is, from 15-25 years of age, it behooves us to use all the resources in our power to eradicate this most deadly, yet preventable disease. Tuberculosis of the lungs has an inherent tendency to become quiescent and, ultimately, to heal.

The responsibility of making a correct diagnosis of a minimum pulmonary tuberculous lesion is no small matter. It is most unfortunate for the patient if one declares his case to be tuberculosis unless he really has it, because of the mental effect alone upon the patient. It is equally important to declare a case as such if one is reasonably sure, because of the necessity of the early treatment of the patient and of the need of protection of those who come in

contact with him. Therefore it is very important to correlate the x-ray findings with the clinical findings if any, and to differentiate the acute or chronic inflammatory disease, or possible new growth.

One of the characteristics of early pulmonary tuberculosis is the existence of protean types of lesions. Dr. Kirklin has clearly outlined the characteristics of tuberculosis in the adult and in children. The size of the fan-shaped, the solitary, the group shadows, or the granular appearance in apexes of early tuberculous lesions, depends upon the associated inflammatory changes or consequence of caseation or fibrous changes. It might not be amiss to review the reason for finding the early lesion located in the outer parenchyma and often in the upper lobe.

It is to be assumed that in the great majority of cases of pulmonary tuberculosis, the tubercular bacilli enter by way of the air passages and are carried from the smaller bronchial divisions through the ductulus alveolaris to the ultimate lobule just beneath the pleura. There they are probably taken by the large phagocytes and are carried to the lymphoid tissue which is abundant at the bifurcation of the bronchioles and bronchi as is demonstrated in the minute anatomy of the lungs by Dr. William Snow Miller.

The lymphatic system being intimately connected with the bronchi, arteries, veins and pleura, is most important in the defense against pulmonary diseases. Dr. Miller suggests that at the point of mixing of the bronchial and pulmonary circulations there may be retardation of the blood flow, offering conditions favorable for the initial tuberculous infection, and as the apices of the lung have less expansion than other parts of the chest, this may explain why tuberculous infections start at or near the apex in the periphery of the parenchyma of the lung.

As stated, the lymph vessels accompany the bronchi and blood vessels along their entire extent, anastomosing freely with each other and connecting with the lymphatics of the pleura. Lymph drains in two directions in the lung, peripherally toward the pleurae and again centrally from the respiratory bronchioles toward the hilum. The pleural lymphatics, parietal and interlobar, return to the hilum over the surface of the lung. This latter course probably explains the initial tuberculosis which starts with a thickened pleura or a small amount of effusion at the base as seen in the roentgenogram. On rare occasions probably necrosis in a subpleural calcareous focus may be the cause of occasional spontaneous pneumothorax.

No doubt the hilus types of tuberculosis, whether in the glands or in the so-called bronchopneumonia type, are most difficult to recognize and differentiate from other inflammatory diseases by the roentgenogram alone.

Regardless of all appearances of health in a child, the majority of children living in a tuberculosis environment will show pulmonary nodules or tracheo-bronchial tuberculous nodes in a roentgenogram, which should receive immediate care.

Dr. Robert M. Deming, Glencliff: I have listened with a great deal of interest to Dr. Kirklin's very able paper and feel that I can add but one or two comments regarding it, chiefly from a clinician's standpoint, as I do not lay claim to being a competent radiologist. The chief comment is that, in this State, partly due to insufficient funds available for that purpose, the taking of an x-ray of a child's or adult's chest entails the expenditure of a sum of money which in most cases is prohibitive, particularly during the present depression. Therefore, it has not been my practice to advise it (although I consider it of the greatest value from a diagnostic standpoint), and consequently have depended practically altogether upon a physical examination, plus a history of the case, general condition of the individual, tuberculin reaction, and subsequent reëxaminations. Another complication is that frequently, when x-rays are taken, the films are not of sufficiently good quality so that a proper diagnosis may be made, partly due to movement, and partly to faulty technique. I have noticed in practice, that flat films only are taken, usually in a prone position and frequently at the end of expiration. I think this is a point that should be emphasized, namely, that all films should be taken with the patient in an upright position, at the height of inspiration and preferably stereoscopic films. While practically all the cases which come to the sanatorium evidence a definite tuberculous lesion both from a clinical and an x-ray standpoint; occasionally patients are sent in for examination as a check-up and we have felt in such cases, that the earliest pathological process shows an increase in the hilus shadows, some peribronchial thickening and an increase in the linear shadows, with a fan-shaped area of thickening in the linear shadows which extends from the periphery toward the hilus, with frequently thickened and mottled markings in the region of the bronchi, and also the presence of large, dense, and possibly calcified peribronchial glands.

The public clinics which are held quite generally throughout this state offer the best opportunity for picking up the early cases of pulmonary tuberculosis but, due to the comparatively large number presenting themselves for examination, plus the limited time available for such examination, and the economic situation which acts as a deterrent toward the request for an x-ray, it has been my practice to lay the greatest stress in the matter of a diagnosis upon the following symptoms, most of which are al-

most consistently present: fatigue and loss of strength; cough and expectoration which persists for six weeks or more, not otherwise accounted for; pain in the chest or pleurisy; hemoptysis of a dram or more of blood; hoarseness and huskiness; loss of weight amounting to five per cent or more of the usual weight within a period of three or four months; elevation of temperature over 99 degrees persisting for several days, not accounted for by individual reaction, menstruation, etc.; rapid pulse after a half hour of physical and mental rest; indigestion, anorexia or "finicky" appetite; nervous irritability; and a history of exposure to an open case of pulmonary tuberculosis. Of course, persistent râles on inspiration, after a cough, are almost diagnostic. The private physician has the same problem as the clinic physician, in that with a busy practice, he has not the time available to thoroughly examine each patient who presents himself with any of these symptoms.

The diagnosis of tuberculosis cannot be reduced to a formula, but I feel that a clinical history of the case, with special reference to contact, plus a chest examination, assisted by x-ray films, followed if necessary, by a subsequent examination or examinations, and not neglecting *several* sputa examinations, would detect a greater percentage of early cases of pulmonary tuberculosis than are being found now.

Dr. E. O. Otis, Exeter: I am sure that everyone must admire the fine films which Dr. Kirklin has shown us. It is quite evident that they have been made by an expert technician and it is quite evident that an x-ray film of the chest to be of the greatest value must be taken by such a trained technician. In small hospitals, x-ray films are often taken by some nurse of limited experience and are often quite unsatisfactory in consequence and cannot be accurately interpreted.

At the present time all experts admit that one cannot make an early diagnosis of tuberculosis without the aid of the x-ray. Then the question comes up, what does one mean by early tuberculosis? Is it simply a lesion in the lungs that has been shown by the x-ray without either symptoms or detectable physical signs? Or is it active disease indicated at least by some active symptoms? As Dr. Kirklin has shown us, some cases which have evident lesions as demonstrated by the x-ray had no symptoms whatever. One case for instance, came to his clinic complaining only of albuminuria, and the x-ray indicated that there was a tuberculous lesion in the lungs but there were no physical signs or symptoms indicating that fact. How then can the general practitioner make a diagnosis of tuberculosis if there are no physical signs or symptoms without the aid of the x-ray? And that he does not always have. The only early diagnosis that he can make must be based upon active symptoms with or without physical signs.

I would like to illustrate the difficulty in making an early diagnosis and in deciding whether active treatment is indicated by a concrete example from my own experience. Some time ago I was called to help to decide the case of a young girl 14 or 15 years of age who was attending the High School. She had been examined by the Massachusetts so-called ten year clinic, which as you know is going about the state examining children of the grade and high schools. An x-ray film had been taken of this girl's chest which was interpreted as showing a tuberculous lesion, and on this evidence alone the superintendent of schools desired to exclude the girl from school. Her family physician was opposed to this decision because, as he said, the girl was apparently well and she expressed herself as feeling well. There were no evident symptoms or physical signs, and the physician saw no reason why she should not remain in school. Such a case, it seems to me, illustrates the difficulties which confront the general practitioner when you ask him to make an early diagnosis, if such a diagnosis can be made only on x-ray evidence, and also when active treatment is to be instituted from such evidence.

As Dr. Deming has said, in many cases the patient cannot afford the price of having an x-ray taken, and the only thing it seems to me that we can expect the general practitioner to do is to rightly interpret the symptoms and physical signs and be keen enough to detect them.

The National Tuberculosis Association has been sending broadcasts respecting an early diagnosis propaganda throughout the country, and the physician naturally asks what do you mean by an early diagnosis? Must I submit every patient that comes to me to an x-ray examination even if he has no symptoms of the disease, or even make a physical examination; or if I am so fortunate as to obtain an x-ray and it shows some evidence of lesion, shall I put my patient under active treatment if there are no active symptoms? In the illustration of the young girl which I have given, should she be taken out of school and sent to a sanitarium, or should she be allowed to continue in school and kept under observation by her physician? Experts at the present time differ in regard to such a question. Some say that if the x-ray indicates a tuberculous lesion in the lung, the patient should be sent to the sanitarium immediately, even if there is no evidence that the patient feels in any way ill.

Dr. Leslie K. Sycamore, Hanover: I should like to express my appreciation of Dr. Kirklin's excellent presentation. I think in any discussion of the early diagnosis of tuberculosis it is worth mentioning that, although in the vast

majority of cases the x-ray film shows more than a clinical examination, you occasionally see a case in which no lesion can be demonstrated by x-ray, but which is undoubtedly tuberculosis by clinical findings, including demonstration of the tubercle bacillus. Of course, there must be a lesion in the lung, and the number of such cases decreases according to the perfection of technique and the experience of the roentgenologist in interpretation. However, there is a certain number of cases in which you see good films read by competent roentgenologists from which the diagnosis cannot be made, and if the clinical findings in such cases are very strongly suggestive, I think the proper procedure is to treat them as tuberculosis, and to have repeated examinations by x-ray at a later date.

Dr. A. S. Merrill, Manchester: I have enjoyed this paper very much. I think it is very valuable to present to a body of medical practitioners in this state because I believe that this subject is very much underestimated by the general practicing physician. This is a demonstration of the assistance which experts can give you in the diagnosis of early tuberculosis, not the diagnosis which is so late that it is apparent to any observer, including the members of the family, but the early case, and I cannot too strongly emphasize Dr. Kirklin's statement that it is one of the most, if not the most, important disease to recognize in its early stages, and I can only refer to one of his closing sentences in which he says that many, perhaps most, of the early cases of this disease are unrecognized clinically. It requires more than a simple physical examination and listening to the history of the patient.

Another speaker has mentioned the objection to the expense of x-ray examination. I think I can say that surely among the small clinics in the small places it is not what we call expensive, and I think it will fully pay for itself by helping in the recognition of a condition in a patient's lungs which has driven him perhaps from one doctor to another and will continue to drive him from one doctor to another until he has spent more than the price of an x-ray examination in an endeavor to get relief from symptoms the cause of which has not been recognized. The technique of a chest examination is a critical matter. It is something which many men in small places are incapable of perfecting. It was a matter of surprise to me to hear from one of the speakers that anybody nowadays relied upon one flat negative. I had thought that the x-ray of a chest in a prone position, when the patient could stand up, was the custom of former days.

Dr. Robert B. Kerr, Manchester: Dr. Kirklin has given to us a wonderfully fine presentation of the whole subject and one that is particularly sane and conservative.

It has been my privilege to hear a number of papers on the x-ray diagnosis of early tuberculosis. I have heard many statements, which, in my opinion, are somewhat radical to say the least. I have listened to the x-ray technician who suggests that the time has come to put the stethoscope into the discard, or that the x-ray has put the stethoscope in eclipse or comparative eclipse, and that it is possible to make a diagnosis of tuberculosis by x-ray only and that conditions which are discernible by the stethoscope must have engendered considerable pathology and created a more or less moderately advanced condition before the diagnosis can be made by the stethoscope. So that the presentation which has been given by Dr. Kirklin this morning is certainly refreshing and, I believe, in accordance with the facts.

I do believe that many cases of early tuberculosis are missed because of the fact that we do not have access to an x-ray. However, I also believe that there should be the utmost collaboration between the clinician and the x-ray man if we are to arrive at an intelligent and conclusive interpretation of the x-ray films.

I believe that the x-ray should be well made and, not only well made, but well read. I have found that even among x-ray men we do not as yet have conclusive information as to the proper interpretation of the x-ray plate in early tuberculosis. I am of the opinion that there is opportunity for real definite conclusions as to what constitutes tuberculosis by x-ray interpretation and reading of the plates.

It is very necessary that there should be the utmost collaboration and sympathetic coöperation between the clinician and the x-ray man. One matter which I think is of considerable importance is whether the diagnosis of activity of a tuberculosis should be made by the x-ray man or the clinician, and whether it can be made upon the interpretation of the x-ray plate alone. That is a matter of some importance, in my opinion. I am not very sympathetic toward the x-ray man who sends me back a report stating that the x-ray findings indicate active pulmonary tuberculosis. I may be mistaken in this, but I am still a clinician and feel that the final decision as to whether an individual is suffering from active pulmonary tuberculosis should be left to the clinician who, presumably, has made an intelligent study of the history, the symptoms, the physical findings, and then taking all that evidence into consideration should correlate it with the x-ray findings and report, and make the final decision as to whether an active lesion is present. This may conflict somewhat with the opinions of the x-ray man, but I still feel somewhat as I have indicated.

I am tremendously impressed with the necessity of the x-ray, not only as an aid in the early diagnosis of tuberculosis but also in the demonstration of non-tuberculosis pulmonary conditions, such as cancer, and other abnormalities.

The x-ray will become more and more a necessary part of the examination of the chest for possible tuberculosis and other conditions. One other point I do not believe has been mentioned, It is this—the x-ray is a great help in follow-up examinations in active pulmonary tuberculosis cases. I am of the opinion that much information can be elicited by the x-ray relative to the progress of the patient towards quiescence or arrest of the process, for the x-ray can depict tendencies toward absorption of previous disease with clearing in some cases and formation of fibrosis in others. Over a period of months, or years of treatment of an active pulmonary tuberculosis patient frequent x-rays can help considerably in determining treatment and progress.

For the intelligent use of the x-ray in the diagnosis and treatment of tuberculosis I feel that the plates should be well made and well read and there should be the utmost coöperation between the clinician and the x-ray man. Under such circumstances the x-ray is and should become more and more a necessity in the diagnosis of early tuberculosis.

Again I wish to congratulate Dr. Kirklin on his splendid paper and particularly his sane presentation of the whole matter.

Dr. Kirklin: I am indeed grateful for your attention and the generous discussion of my paper. I do not wish to leave the impression that I advocate roentgenologic methods as a short cut in making a diagnosis in any field. Although I have a deep conviction that the roentgen rays are indispensable in the diagnosis of pulmonary tuberculosis, nevertheless I wish to reëmphasize the fact that only through the most active coöperation between roentgenologist and clinician will the patient derive the greatest benefit. The fact that roentgenologic diagnosis has been developed to a high degree of accuracy places a heavy responsibility on the roentgenologist and demands that diagnostic errors be held to a minimum. Generally speaking, I am of the opinion that in this field of endeavor there are more roentgenologic errors of commission than of omission.

One cannot minimize the importance of meticulous technic, but on the other hand, in some quarters there is a tendency to overemphasize the necessity for extremely high milliamperage technic. It is imperative that apparatus of sufficient capacity be available to produce roentgenograms with a maximal exposure of from 1/10 to 1/20 second at a distance of from 5 to 6 feet in order to stop motion and minimize distortion, but anything more than this is luxury. A roentgenogram of the finest quality is worthless unless interpreted by a physician with adequate roentgenologic experience.

In conclusion, Mr. President, I should be very unappreciative if I did not thank you and the other officers of the New Hampshire State Medical Association for affording me the honor of addressing this society. I thank you.

MISCELLANY

THE ANNUAL FALL MEETING OF THE COOS COUNTY MEDICAL SOCIETY

At the annual fall meeting of the Coos County Medical Society the following officers were elected:

President: T. C. Pulsifer, Berlin.

Vice President: W. F. Noyes, Colebrook.

Secretary-Treasurer: Mertrude Belle Dennis, Colebrook.

Delegates to State Meeting: W. H. Leith, Lancaster; J. J. Cobb, Berlin.

Alternates: W. R. Schillhammer, Groveton; N. B. Dresser, Berlin.

Auditor: Bruce Kelly, Colebrook.

Medical Defense: Wm. H. Leith, Lancaster.

A RESOLUTION OF APPRECIATION OF DR. ALPHONSE W. PETIT

Dr. A. W. Petit, after over fifty years of active practice in Nashua, has retired and will make his home in the future with his daughter in Manchester.

A leader in his profession, he has served as president of the Nashua Medical Society and of the Hillsborough County Medical Society. Long active as the head of the staff of St. Joseph's Hospital, he was recently elected president emeritus of the staff which, at a meeting held on November 15, adopted the following resolution:

For many years a kindly, courteous gentleman, he served as president of the staff of St. Joseph's Hospital.

To his wise counsels and his exemplification of the highest standards of professional excellence, we, his juniors, owe much.

Be it therefore resolved, that his associates on the hospital staff express their sincere regret at the resignation of Dr. Alphonse Wilfred Petit and that they wish for him, in his retirement, the full measure of quiet, happiness, and contentment which he has so thoroughly earned and which he so richly deserves.

NEW MEMBERS

Gardner F. Manning, M.D., 384 Hanover Street, Manchester, N. H. Graduated, Boston University 1931, licensed 1931.

Sarah M. Hobson, M.D., New Ipswich, N. H. Graduated Boston University 1890, licensed New Hampshire 1931.

VERMONT STATE MEDICAL SOCIETY

GLAUCOMA*

BY EDWARD H. CARY, M.D.†

THE story of Glaucoma abides with us. For three-fourths of a century the subject has been handled with renewed interest from many angles. Though the literature has been abundant, it will never cease until the restless scientists have developed a more exact conception of the etiological factors leading to intraocular pressure in so-called primary glaucoma. It would seem, technically, that glaucoma is largely secondary.

Though it be true that this symptom of intraocular pressure seems understandable in many persons, the complexities vary in individuals, hence it is well to review repeatedly the subject so that we may better interpret many of the conditions which arise, as well as the occurrences which frequently precipitate intraocular pressure and the diagnosis of glaucoma. We have methods at our command which, if used, would lead to a recognition of potential and impending glaucoma, and we should have the will to use this knowledge so that we may interpret the earliest tendency to the glaucomatous eye.

Intraocular pressure is basically a most important fact, yet, not to think of it in a relative sense would negative many examinations. A twenty-point pressure is destructive to the integrity of some eyes, hence there is good reason to suspect that many of the glaucoma simplex cases have never had greater tension than this.

No doubt you have seen in young adults the anterior segment of the eye yield to this so-called normal pressure, sometimes producing a keratoconus. I can recall a young man, 18 years of age, seen rather early in his corneal changes, upon whom I did a modified Lagrange with excellent results. Tension before the operation was 20 and after operation 14. The boy's vision improved and he could return to his studies.

Deep cupping occurs with apparently normal tension and suggests a weakness of the lamina cribrosa.

The visual field will correspondingly reflect a progressive loss characteristic of the atrophy which ensues.

Glaucoma is classified as non-congestive and congestive in type, with the term acute, subacute and chronic, used to describe variations of the result of intraocular pressure in point of time and result of pressure.

In glaucoma simplex with advanced pathology, operations have been unsatisfactory. I dare say with an earlier recognition of the structural defects either medical treatment or operative work would be more satisfactory.

Gradle has described his method of making a diagnosis of simple glaucoma where the visual field and other suggestive symptoms are not present. He hospitalizes the patient, and subjects him to three or four tests having the tension recorded at four-hour intervals for four periods during the day. He states that while each of the tests may be negative, it does not exclude the possibility of glaucoma. When the tension curve goes up to the coffee test or dark room test, however, or the use of euphthalmine, the relative tension of that eye, having gone up under such circumstances becomes positive, and of great value.

Another provocative test is one by Kronfeld, who withdraws, with a hypodermic needle, the fluid from the anterior chamber, watching the tension curve of the eye every thirty minutes for periods of two hours. He claims that the normal eye never develops tension over forty points pressure following withdrawal of fluid from the anterior chamber, and this tension soon recedes to normal, which is less than 35.

While the pre-glaucomatous eye goes beyond 40, usually around 50, it soon returns nearly to normal pressure.

We must consider these provocative tests, which develop the potential glaucoma cases, as most important.

They offer the means of preventing many visual catastrophes. They also suggest the necessity of periodical examinations, in many cases that have not been diagnosed heretofore until the condition has become frankly glaucomatous.

An oculist should know the potentialities of every eye he is permitted to examine.

Having said this much about glaucoma simplex, I am inclined to omit further discussion of this type, only adding that factors of age and the changes that come with it, develop toxemias that embarrass the vascular structure of the eye and lead to obstructions of the venous channels, and if this happens, the type of glaucoma will then depend upon the degree of intraocular pressure and the rapidity with which it occurs. The effect of this pressure upon the structures of the eye and its function will be determined by the compensatory reaction and the ability of the organ to right itself which,

*Read before the Vermont State Medical Society, Burlington, Vermont, October 6, 1932.

†Cary — Professor of Ophthalmology and Oto-Laryngology, Baylor University College of Medicine. For record and address of author see "This Week's Issue," page 1660.

of course, depends upon certain favorable factors, locally and throughout the body.

In discussing the many types of glaucoma, we think of intraocular pressure and its results as a basis for our diagnosis.

It has been stated that you will find in eye patients who are over forty years, as high as six per cent of the total number, glaucomatous.

For many years we have accepted that one out of every one hundred eye cases in the large clinics could be classified as glaucoma.

Undoubtedly the application of modern methods of diagnosis would change this estimate. In our offices we are able to diagnose many early cases of glaucoma.

Realizing that blindness is inevitable unless suitable treatment is instituted, and early diagnosis is imperative if one hopes to check the progress of this disease, it is important to give routine attention to certain known methods of examination, carefully considering the evidence that is developed.

Unless a patient is myopic, the average patient at 40 should have a small pupil. A pupil of four mm. or larger is suggestive, but should not be considered by itself, but in connection with other symptoms.

The anterior chamber may not be shallow, and yet one could have glaucoma. The depth of the anterior chamber depends somewhat upon the flow of the intraocular secretion. While depth does not preclude the existence of glaucoma, a shallow anterior chamber arouses suspicion of every eye where this condition is found.

Instrumental measurement of intraocular tension is essential. No man should trust his fingers as a guide to tension. A good tonometer, with a good technique in its use, is extremely important. It should be employed in every case where there is the slightest suspicion of tension and it can be considered a good routine practice upon every patient over 35 years.

One should look for the earliest evidence of cupping. While cupping is to be expected, as the result of tension, we should be interested in making a diagnosis before cupping is established. Many times tension may be found normal, while cupping is the definite and deciding point in the diagnosis of glaucoma.

Taken in connection with the field of vision, we explain absence of tension in this type of glaucoma on the theory that the eye is in that state periodically when not under observation. It is thought that it occurs at night when arterial tension, during sleep, might aggravate or permit venous congestion, which tends to intraocular tension, and if so, brings about cupping and visual field changes.

We must remember that many patients have awakened at night with attacks of inflammatory glaucoma. Visual field defects are a most valuable guide considered in the light before mentioned.

The field pathology is said to be the result of progressive atrophy of bundles or groups of nerve fibers, which successively yield to the pressure and stretching process. The optic nerve passes through the lamina cribrosa with its support and offers greater resistance to pressure in some eyes than in other, yet in time, pressure produces functional disturbances followed by atrophic changes, certain fibers are first involved, and this is expressed in the field of a given eye and can be charted accordingly.

The method we have adopted is the stereocampimeter of Lloyd's. Binocular fixation gives both fusion and fixation. There can be no fusion, and continuous fixation is difficult.

In glaucoma, the slender extension of the blind spot, either up or down or both may be detected and it is called Seidel's sign. When it becomes larger it becomes Bjerrum's sign, due to more or less atrophy of the arcuate fibers producing a scotoma starting from the normal blind spot circling the fixation point.

When this broadens at the horizontal meridian, it removes a sharp angle from the field, then we have the so-called Roennie's nasal step.

If one of the bundle of fibers becomes affected sooner than others, there may be an isolated scotoma or a ragged edge to a scotomatous area known as Elliot's sign.

Lloyd's campimeter is helpful in determining many things of value around the macula, but the old perimeter of Foster is daily needed for peripheral fields, especially for white.

To say that we do not know the cause of glaucoma and leave it at that is, I think, misleading, and encourages slovenly thinking. I shall attempt to condense for you a few interesting theories.

Since glaucoma is not a disease, but a symptom common to many diseases, it is illogical to look for an explanation of every rise of intraocular pressure along the same lines.

Lagrange says the sick body must also be considered before you can understand an eye with this disease. It has been said that an essential postulate for the continuation of the circulation in the eyeball, is that the arterial pressure be higher than the capillary, the capillary higher than the venous, the venous higher than the intraocular. The capillaries being the chief regulators of intraocular pressure, any obstruction of the venous outflow is of much more importance to the eye than high pressure in the arteries. This preponderating influence of any obstruction of the venous is due, in all probability, to its immediate effect upon the capillaries. An example is the ligation of the venae vorticosae which will, at once, precipitate an acute glaucomatous seizure.

The behavior of the capillaries is the one thing that is physiological and pathological.

The capillaries are not only the dynamic part of the circulatory system, but also demonstrate purposes for which the circulation of the blood exists.

We all know that the tension of the eyeball depends upon the fluid content of the globe, and the theory generally accepted is that the intraocular fluids are derived from the capillaries of the ciliary process, and that in a state of health a close relation exists between intraocular pressure and general blood pressure.

Intraocular fluids supposedly pass forward through the circulatory space, the posterior chamber, and the pupil to reach the angle of the anterior chamber from which they escape from the eye into the canal of Schlemm, through the filtration space in the pectinate ligament.

When that mechanism is in proper working order, the tension of the eyeball is liable to very slight variation, consequently the intraocular pressure *resembles* general blood pressure, in so far as both are maintained at a fairly constant level, under ordinary circumstances, but sudden and great variations are liable to occur in such morbid conditions as glaucoma and hyperpiesis.

High blood pressure, however, is not an essential factor. Arterial pressure must exercise a certain amount of influence upon the tension of the eye, but the important factor in the regulation of the intraocular pressure is the pressure in the capillaries. If this be true, then the study of the capillary circulation in the eye will be of value.

The normal eye takes care of hypersecretion, hence it is true at the corneoiridic angle there must be some pathology which obstructs the fluids, and it is the tension from retention which produces the damage.

Knies and Webber suggested, and Priestly Smith supported the retention theory. The study of the pathological anatomy of an eye removed on account of glaucoma has never been illuminating for the end results do not reveal the cause of the disease.

Bryson has pointed out the importance of the capillaries in all vital activities, and that the other parts of the vascular symptoms are controlled by them and are subservient to their requirements. There is an interesting lot of work in which the capillaries of the body are described as acting independently; they are called into use when required, as there is an enormous reserve of shut-down capillaries in an organ while it is resting.

It is interesting to have a cell described as gaining its nutrition through a harmonious action through the capillaries, which act is recognized by the needs of the cell, and this process is happening all over the body, as cells need food, but of course, not happening for all of the cells at one time.

Complete dilatation of the capillaries would be destructive, for the arterial tree would be emptied, stagnation take place and the circulation would cease.

While the tissue fluids come from the blood plasma by dialysis through the walls of the capillaries, the permeability of the capillaries is one of the most important factors permitting only the right quantity and proper quality of nutrient fluid to be dialyzed by the blood plasma. In the eye it is said we have a biological adaptation to keep the intraocular fluids, as far as possible, optically homogeneous.

Again it has been said that the first departure from health in the eye is indicated by dilatation and increased permeability of its capillaries, but except in the case of direct injury the cause of this must be sought far more in the general health of the patient than in the eye itself. The eye is not only in the body, but it is also of the body. That is the key to the proper understanding of the glaucoma problem.

We might also recognize what is impending through a study of the dulling of the sensitivity to dim light as worked out by Derby, Wait and Kirk, which is described as being due to interference with the function of a layer of rods and cones of the retina which derives its nourishment from the choriocapillaries. If this dulling of sensitivity to light is not observed and checked, there follows with loss of vascular tone stagnation of the blood so that the rods and cones suffer, hence the light sense becomes disordered. All of this occurs before tension. This suggests again that glaucoma is fully established before there is observable evidence on the surface of the globe. With a more widespread stagnation of the capillaries, acute glaucoma supervenes.

A loss of tone in the walls of the capillaries is charged with being responsible for the onset of an attack of glaucoma. This is likely true, but there is also the small eyeball, the wear and tear of life, with its accumulative poisons and its vascular degeneration usually present. With this background, an attack can be precipitated by many concurrent conditions, such as excessive fatigue, indiscretion in diet, overdrinking, overexcitement, etc., none of which would precipitate glaucoma in the normal healthy young person.

Fischer has pointed out for us, the effect of acidosis upon the eye, and while this has been called in question, glaucoma very likely occurs on account of it. As fatigue is given as one of the things which precipitate glaucoma, I raise the question since all fatigue is basically a result of acidosis existing locally, plus the enumerated factors occurring in an hyperopic individual that would make glaucoma likely.

The circulation in the eye being arterial, capillary and venous, any abnormal blood plasma might involve the capillaries, first stretching

them and if too permeable, molecular disturbance of the vitreous may occur, producing swelling, and then starting a vicious circle with intraocular pressure and its destructive influences.

You can readily understand how one degree of pressure leads to another, and finally the severity of the attack is determined by the extent of the closure of the outlet or loss of compensatory factors in restoring the outlet.

Again, it is not known whether the toxins are of biochemical or bacterial origin, which may cause the dilatation of the capillaries with increased permeability of their walls, but if this occurs, there would be swelling of the vitreous, pushing the lens forward, producing a shallow anterior chamber. This substance is supposed to be a colloid and capable of much swelling, but what actually occurs and produces the swelling is not known.

Focal infection has been so often observed in connection with glaucoma and there have been many cases of tension of the globe relieved when the apparent infection was eliminated.

No paper reciting the underlying causes of glaucoma would be complete without calling the attention, even briefly, to the fact that with the wear and tear, overwork, autotoxins, and other influences which could set up vascular and cardiovascular disease, the environment is all that is needed for some concurrent local or general disturbance to precipitate glaucoma. In this connection, one can see how a local acidosis in the eye or a general fatigue acidosis, or one of any kind might precipitate acute inflammatory glaucoma.

There are other glaucomatous attacks worthy of note. Gifford says: "Morgagnian Cataract, through the absorption of the broken down nucleus, can cause glaucoma." This has been accepted by Feingold, but controverted by Knapp, who has felt that it was the result of an irritation due to the motion of the lenticular substance held within the capsule. The facts remain that glaucoma has been observed in connection with many different changes in the appearance of the crystalline lens.

There is, no doubt, a basis for the observation of glaucoma described as of neuropathic origin. I have seen a loss of constrictor control in many eyes; that is, an interference in the normal vasomotor control of the vascular supply of the external globe. This can be traced, apparently, to many conditions: eyestrain, loss of sleep, constipation, particularly nasal reflexes from nasal pressure.

It is only a step farther to find the intraocular capillaries engorged from one of these, or a combination of one or more, particularly the nasal pressure disturbances.

I find in the literature under Meckel's Ganglion and Glaucoma, by Byrd, report of two interesting cases (one his wife), in each of whom there have been frequent attacks of intraocular pressure which was relieved by cocainizing Meckel's Ganglion. In this, he claims to have discovered this connection and charges the literature with not having anything on the subject. I have shown in years gone by, slides of two or three interesting patients reported many years ago, in which nasal operations eliminated the pathology which was disturbing the sympathetic nervous system, and by which operations had controlled the tension. There are types of glaucoma occurring at various ages resulting from pathology in and around the sinuses, the cure for which would not be likely, unless the physician recognized the type.

I feel sure that the vasomotor constrictors are at fault. There is evidently a loss of inhibition and vascularity, particularly the capillaries become overdilated, so anything that happens to relieve this situation, restoring normal vasomotor control is the source of relief in that type of case. I have reported such cases and have had an opportunity to observe three for periods of five, eight and ten years.

Then again, viewed from another angle, it is interesting to know that the body contains two groups of substances, mutually antagonistic, a histamine group acting as dilators of the capillaries and an adrenalin group acting as contractors. Also it is important to consider what effect a toxin, which upsets a delicately balanced mechanism controlling the function of the endocrin glands, thereby interfering with the normal action of the sympathetic nervous system, may have under different circumstances.

Adolescent glaucoma has been observed in young people where there is apparently a family tendency to this disease, and where there is possible endocrine disturbance. Sanderson claims to have seen many cases of this kind. Where we live, and where the mineral salts are obtainable in the food supply of our people goiters are not common. We seldom observe this type of case.

Tooke reports five interesting cases of glaucoma, complicating iridocyclitis. In these cases there was a deep anterior chamber due to the canal of Schlemm and the spaces of Fontana having become occluded by dense pigmentary deposits and exudate. This is a definite type of glaucoma which is reckoned in terms of intraocular pressure with deposits upon the Descemet's membrane with iritic changes, the result of inflammation which is caused by some infection, the focal point of which is far away from the eye.

It is this type of case which Doctor Park Lewis has reported under the title of "Non-operation Treatment of Inflammatory Glaucoma." His treatment has consisted largely of exposure of the patient to radiant light made by a carbon filament in an electric light bulb at a temperature of 125° Fahrenheit for one hour, preceded by using drops in the eye of

a solution of bicarbonate, biborate and chloride of sodium, one per cent each in a solution of equal parts of water and glycerine, this being dropped into the eye followed by the use of heat.

TREATMENT

From what has been said, holding to the fact that all glaucoma cases are secondary to some other condition, either local or in the general body, the treatment is broadened far beyond putting drops in the eye and operating, when permitted to do so. It goes without saying that every glaucoma case presents an individual problem and should be approached with a desire to know all of the facts that can be developed through a very definite study of the case.

Of course, you would not fail to use miotics, nor would you quibble about operating if you were in a position to gain these facts and to safely utilize the time for that purpose, but I am sure that the ophthalmologist should realize that glaucoma is a larger problem than drops and operating, and will assume the responsibility of treatment in a case of this kind anxiously developing the facts that can be obtained through the laboratory history and physical examinations which would lead to a correct analysis in a given case.

You are aware of some sixty procedures that have been used under the head of "Operations" for glaucoma, and there is a very great difference in opinion at this time, as to which operation offers the best chance to the patient. Each man is likely to select an operation which he can most skilfully perform.

The operation described by Reese is an elaboration of an old operation performed in the New York Eye and Ear Infirmary for years by all of us who had that training, and it is likely that is the reason for our belief that it is the best operation for glaucoma. Doctor Reese, unquestionably, put into our hands a keratome made in a different angle and broader, which makes the operation easier, giving a broader section with less penetration with the point of the knife. I value Doctor Reese's keratome very highly. The method adopted to roughen or get rid of a part of the sclera flap is the elaboration of the old operation. It can be called a modified Lagrange, and from this you can get all the values of a trephine operation with slight likelihood of later infection.

Calhoun gives a very good description of the Reese operation and his reason for utilizing it.

When you realize that it is sometimes necessary to do more than one operation to get the best results, and make this known to your patients, this procedure can be repeated and the patient given every chance. I have had to operate on the same patient more than once, and to the advantage of the patient.

With an experience running back thirty years I have in retrospect, failures that seemed inevitable, but there is also gratitude for an operative procedure that has been exceedingly helpful to my patients. I also use Elliot's method. I too, after the use of the trephine, have had a patient come back with pan-ophthalmitis which had developed two years after what was looked upon as a very excellent operative result.

The most valuable operation, where the angle is blocked by the adhesion of the iris to the cornea, is the Lagrange.

The incision or section being carefully made with a cataract knife, the point of the knife so directed that you have actually passed the knife through the adherent iris, and are able to separate it from the cornea and open more definitely the filtration angle.

Our experience would lead us to give great weight to the opinion of Emil de Grosz of Budapest, who recently recorded his results in many hundreds of operations in March, 1931, *Archives of Ophthalmology*.

We have not used the operation of cyclodialysis as a routine in chronic inflammatory glaucoma, but will do so more often. This operation is a very safe one, although it may be necessary to repeat it.

There have been so many operations offered, many of them I would be glad to discuss, but the literature is abundant and you will be guided by your own experience which has been largely the result of following some method observed and utilized by an operator in whom you have confidence.

Wilmer, in discussing the result of the operative treatment of glaucoma, gives a table which supposedly describes the successes and failures of certain surgeons utilizing various operations. He offers an operative method of transplanting some of Tenon's capsule as a graft turned upside down, which lies in front of the trephine opening and becomes attached to the raw surface of the conjunctiva above. He claims excellent results from this operation. His reprint has a most elaborate bibliography upon the subject of glaucoma to which I call your attention.

Sclerotomies and many other procedures have their values under certain circumstances.

We are confronted with patients, particularly the non-congestive type, where expectancy of life is not long, or patients who are blind in one eye from glaucoma with a small field, and good central vision in the opposite eye, and further, in patients where one eye has been lost by an operation.

Such condition should lead one to delay and try his skill in every way with medicine before utilizing any operative procedure.

Glaukosan or adrenalin subconjunctivally, and miotics are in some instances a very great aid in the reduction of tension and creating a situa-

tion more favorable for operation, particularly is this true in those types of glaucoma where there is tension and yet where the tension is not primarily due to the swelling of the vitreous. Acute inflammatory glaucoma is not relieved by this means.

The subconjunctival injections of adrenalin or the use of glaukosan both stimulate endings of the sympathetic nerves. They are both accompanied by a decrease in the intraocular tension and this fact is apparently due to the pronounced local vascular constriction and possibly, secondary lessening of the lymph flow into the ocular chambers.

Vascular constriction is always followed by a vascular dilatation and in the eye this secondary effect results, according to Rupert, in increasing intraocular pressure, therefore a strong miotic should always be used.

I have added the following references. I am particularly indebted to A. M. Ramsey for his discussion and have boldly utilized some of his views. The whole subject, however, is overlapping and of interest.

REFERENCES

1 Knapp, Arnold: Observations on glaucoma in morgagnian cataract. Arch. Opth. 56:124, 1927.
2 Peter, Luther C.: A simplified conception of visual field changes in chronic glaucoma. Arch. Ophth. 56:337, 1927.
3 Gifford, H.: The cause of the glaucoma of hypermature cataract. Arch. Ophth. 56:457, 1927.
4 Waite, J. Herbert: How primary glaucoma may arise from disturbances in the physico-chemical forces which regulate intraocular fluid exchange. Arch. Ophth. 56:460, 1927.
5 Friedenwald, Harry: Posterior sclerotomy for glaucoma. Am. J. Ophth. 11:107, 1928.
6 Thomasson, A. H.: The value of scotometry in the diagnosis and treatment of glaucoma. Arch. Ophth. 57:160, 1928.
7 Lewis, J. B.: Some notes on glaucoma. M. J. Australia. 1:232 (Feb. 25) 1928.
8 Ramsay, A. Maitland: The pathogenesis of acute primary glaucoma. Brit. M. J. 1:789 (May 12) 1928.
9 Moore, G. A.: Observations on glaucoma. Boston M. & S. J. 191:476 (Sept. 11) 1924.
10 Lewis, F. Park: A nonoperative treatment of inflammatory glaucoma. J. A. M. A. 89:2022 (Dec. 10) 1927.
11 Byrd, H.: Meckel's ganglion and glaucoma. J. Florida M. A. 10:39 (Aug.) 1923.
12 Calhoun, F. Phinizy: The nonoperative and operative treatment of glaucoma. Am. J. Ophth. 8:849 (Nov.) 1925.
13 Sanderson, D. D.: Adolescence glaucoma. Nebraska M. J. 9:322 (Aug.) 1924.
14 Tooke, Fred T.: Some features of glaucoma complicating iridocyclitis. Am. J. Ophth. 11:97, 1928.
15 Wilmer, W. H.: Discussion on the results of the operative treatment of glaucoma. Tr. Ophth. Soc. U. Kingdom. 57:230, 1927.
16 Würdemann, Harry V.: The relations of cupping of the optic disc to visual fields in glaucoma. Am. J. Ophth. 10:831, 1927.
17 Gradle, H. S.: The use of adrenalin in increased intraocular tension. Am. J. Ophth. 7:851 (Nov.) 1924.

MISCELLANY

ADDISON COUNTY MEDICAL SOCIETY

At a meeting of the Addison County Medical Society held Wednesday, October 5, at the Porter Hospital, the moving picture, "Traumatic Surgery of the Extremities," made by the Davis & Geck Co., at the Yale Medical School, was shown. Dr. Leighton Sanders of Shoreham was voted a member. Eight members and several guests were present.

ESTELLE FOOTE, M.D., *Secretary.*

A COUNTRY DOCTOR HONORED BY COMMUNITY

On the evening of his forty-fourth year of service in West Berkshire, Vt., Dr. C. U. Johnson was given an appreciation banquet, November 16, 1932, arranged by the local Methodist Church. The throng was so great that the banquet had to be served in relays. The tables were set four times and the service of appreciation was continued in the church sanctuary. The testimonial was a surprise to Dr. Johnson.

Vice-President of the State Medical Society, Dr. John Blodgett of Bellows Falls, was the first speaker and brought an impressive message entitled "The Call to Service and the Country Doctor."

Dr. Blodgett called attention to the disturbed condition in which rural communities live, the individualism of America and the equality of opportunity, and the unsettled state of the world. He felt that progress is the reward of endeavor as shown by the early pioneer and further exemplified through organization of the county, state and nation. With this growth, complications due to the demands of labor and industrial rivalry have been brought about. The practice of medicine, however, has continued to meet the needs of the people and theology, law and medicine continue to hold commanding positions in national life. They gave character to our early civilization. Doctors, lawyers and preachers have moulded the character of the people with the growth of cities. The country districts were depleted of much of their influence, but the country doctor carried on. Dr. Blodgett's personal opinion is that we are about to see the country come into its own again, because of the tendency to return to rural life. Such cities as New York and Chicago are falling because of their weight and impaired credit. They are overpopulated and underfed, miserably governed and crime is rampant. Through the radio, flying machine, the printing press and automobile, distance is annihilated. There are no longer cities, or country, in the old sense of the words. But in America, Individualism is declining. Communism, socialism, fascism, autocracy have taken their toll. The plight of the medical profession is now desperate. No longer can the country doctor make his way. That splendid doctor, that masterly friend, that wise counselor, that sacrificing soul, that enchanted vision—can it be that the country doctor is to be no more?

The speaker's closing remarks were directed to Dr. Johnson—"We salute you. To the call of service you have responded with your all. Warm friends, the greatest blessings, are all about you. We wish you years of enjoyment, of the fulfillment of the ideals of service. May these words be said for both you and me—

" 'Sunset and evening star, and one clear call for me,
And may there be no moaning of the bar when I put out to sea.' "

At the hour set for the banquet, Dr. Johnson, escorted by the Rev. Roger W. Fitzgerald, was seated between Dr. John Blodgett, Vice-President of the

State Medical Society, and Dr. Johnson's close medical friend, Dr. C. G. Abell of Enosburg Falls. Following the banquet, Dr. Johnson was escorted to the speakers' platform by Dr. Blodgett and Dr. Abell.

The toastmaster, Rev. R. W. Fitzgerald, introduced first, Dr. Johnson's close medical friend, Dr. C. G. Abell. Dr. Abell brought a message of welcome to the doctor. The toastmaster then introduced delegates representing the different towns in which Dr. Johnson serves. Each delegate paid glowing tribute to the ability, the faithfulness and the Christian service Dr. Johnson has given to them and to the communities in which they reside. The delegates in turn were Otis Hefflan, Franklin Center; Mrs. Bernice Towle, South Franklin; Pearl Colcord, East Franklin; Jasper Van Antwerp, Frelighsburg; Cortes Chaffee, North Berkshire; Clayton Rublee, Berkshire Center and East Berkshire. Dr. L. E. Samson spoke eloquently on the theme "A Young Doctor to an Older One." Dr. R. M. Pelton of Richford brought a brotherly greeting on—"An Older Doctor to an Older Doctor." Rev. Rutherford H. Moore spoke on the theme—"A Preacher to a Doctor."

Among the doctors from a distance were Dr. E. A. Hyatt of St. Albans, Dr. H. D. Hinman of Enosburg Falls, Dr. H. H. Johnson of St. Albans, Dr. W. B. Hyde of Bakersfield.

At the close of the service, Dr. Johnson was presented with a leather loose-leaf note-book in which were written the names of his many friends. When called on for a few remarks, Dr. Johnson modestly said, "I am so surprised at this great gathering, including so many doctors, that this recognition is not deserved. I do not know what to say, but I feel like the preacher who when it was time to deliver his sermon discovered he had left his notes at home. Though I feel sure I do not deserve all this, I am deeply grateful for this expression of your appreciation."

Dr. C. U. Johnson is 69 years of age and maintains his regular practice. He has wrought his life of service into the very hearts and homes of his people. All love him, respect him, appreciate and honor him. In the words of Rev. R. H. Moore, all must say, "There is no doctor like a Christian doctor, and Dr. C. U. Johnson is a Christian doctor."

VERMONT DEPARTMENT OF PUBLIC HEALTH

OCTOBER, 1932

Communicable diseases reported to the Department of Public Health during the month of October were as follows: chicken pox 62, diphtheria 17, measles 9, mumps 88, scarlet fever 35, whooping cough 30 and tuberculosis 15.

The Laboratory of Hygiene made a total of 1,942 examinations in October classified in the following manner:

Examinations	
For diphtheria bacilli	679
For Widal reaction of typhoid fever	35
For malarial parasites	0
For Tubercle Bacilli	179
For evidence of syphilis	418
For gonococci in pus	148
Of water, chemical and bacteriological	54
Of milk, market	73
Of milk, submitted for chemical only	5
Of milk, submitted for microscopical only	59
Of water, bacteriological	212
Of foods	5
Of drugs	4
For the courts, miscellaneous	13
For the courts, autopsies	1
Of animal heads for evidence of rabies	0
Miscellaneous	57

Forty-eight cases of gonorrhea and fifty-nine cases of syphilis have been reported to the Division of Venereal Diseases. Three hundred and forty-two Wassermann outfits and 140 gonorrheal slides were distributed by this Division.

The director of the Tuberculosis Division gave 37 health talks to rural schools, high schools, women's clubs, and other organizations. Over 600 volumes of the new books Keep Well have been distributed to teachers of the state. Eleven thousand copies of the Modern Health Crusader have been sent out.

The nurses in the Division of Poliomyelitis Aftercare visited 49 homes in October and saw 180 patients. Twenty-three new pieces of apparatus were fitted, 15 orthopedic corrections to shoes, 2 pieces of apparatus altered or repaired and five doctors visited. The usual fall clinics have been held at eight centers with an attendance of 135 patients. Sales have been made amounting to $375.33 by the vocational worker in this division.

Seven towns were visited by the State Advisory Nurse assisting P. T. A. meetings, preschool clinics, school clinics and women's clubs. Six hundred and sixty-four pieces of literature were sent out and 595 notifications of birth registration were issued.

RECENT DEATHS

DAVIDSON — DR. ALAN DAVIDSON, a practitioner of medicine and surgery, of sterling qualities, was born in Burns, Ontario, in 1867, and died at his home in St. Albans, Vermont, October 26, 1932, after a brief illness of angina.

Dr. Davidson began the practice of medicine at St. Albans, Vermont, in 1896, and for the past 15 years he specialized in general surgery. He was chief surgeon for the Central Vermont Railroad and senior surgeon at the St. Albans Hospital, and a member of that institution's board of trustees. During the World War he was a member of the Franklin County selective service board.

His degrees include Doctor of Medicine, College of McGill, member of the Royal College of Surgeons of England, Royal College of Physicians of London, Fellow of the American College of Surgeons and American Medical Association, member of the Ver-

mont State Medical Society, and the Franklin County Medical Association, and the University Club of Montreal.

He received his early education in the public schools of Burns, Ontario. After completing his primary education, he graduated from the high school at Sistowel, Ontario, and from the Collegiate Institute at Brantford and Woodstock, Ontario. He entered McGill Medical College in Montreal in October, 1890, and was graduated with honors in 1894. He entered the Royal Victoria Hospital, May 1, 1894, as senior house surgeon and in 1896 came to St. Albans to practice.

He is survived by his widow, Mrs. Helen MacMahon, one daughter and two sons and a brother of San Rafael, California.

FERRIN—Dr. C. M. Ferrin, Essex Junction, Vermont, a general practitioner of sterling qualities, was born in Holland, this state, September 27, 1837, and died at the Mary Fletcher Hospital, Burlington, Vermont. September 28, 1932, after a three days' illness, the result of a fractured hip.

Dr. Ferrin was actively engaged in the practice of medicine in East St. Johnsbury, from 1865 to 1871, then moved to Essex Junction where he practiced for 46 years continuously. He retired from practice in 1917.

Dr. Ferrin received his preliminary education in Holland. He was a graduate of the University of Vermont College of Medicine.

He is survived by two daughters, Miss Caroline B. Ferrin and Mrs. E. D. Williams.

POND — Dr. Edmund M. Pond, a practitioner of medicine and surgery, of sterling qualities, was born in Rutland, Vermont, June 2, 1865, and died at Coral Gables, Florida, October 2, 1932.

Dr. Pond was actively engaged in the practice of medicine and surgery in Rutland from 1895 to 1923 when he moved to Coral Gables, Florida.

He received his preliminary education in Rutland, Vermont, and was a graduate from the University of Vermont College of Medicine in the year 1889 and from New York College of Physicians and Surgeons in 1893.

He is survived by his widow, formerly Katherine Ross, and a daughter Mrs. Richard T. Morint of Montclair, New Jersey, the child of a former marriage, and a son, Edmund M. Pond, Jr., a brother Dr. Erasmus A. Pond of Brooklyn, New York, and a sister, Mrs. Frank S. Atwill of New Jersey.

RURAL HEALTH EXPERIMENTS IN MASSACHUSETTS

Thirty Massachusetts towns are now making important experiments bearing upon the future efficiency and cost of public health work. These experiments have been made public by a grant of the Commonwealth Fund in New York. The purpose of this work is to find a way to give small communities better health service. This is especially important because rural areas are particularly apt to be unappreciative of the importance of health measures and do not appropriate enough money for the support of public health officials, nurses, inspectors, laboratories and other agencies to ward off or control contagious diseases and insure adequate guidance and supervision of sanitary measures.

Dr. W. F. Walker who is Director of the Commonwealth Fund of New York gave assistance in the organization of these experiments in Massachusetts. He states that community health service has at least three objectives. The first is to increase the span of life, more often spoken of now than formerly in connection with public health programs. The second objective is increase in human efficiency, which is highly appreciated in the industrial life. The third is increased enjoyment of living, possibly the most important result of improved individual and community health.

It is set forth that it costs so much to attain these objectives that small communities cannot afford to set up efficient health organizations. It has been found also that health regulations are very often more or less influenced by political considerations and has been suggested that, whereas small towns of themselves may find it impossible to appropriate the necessary funds for carrying on this work, groups of towns may be developed so that their accumulated money and influence may be used in promoting efficient health service. One of the illustrations of benefits of this movement is in the Southern Berkshire Health Unit composed of sixteen towns, Alford, Becket, Egremont, Great Barre, Otis, Richmond, Sandisfield, Sheffield, Lenox, Monterey, Mount Washington, New Marlboro, Stockbridge, Tyringham, West Stockbridge and Lee. Their total population is about 22,000 which is regarded as about the right number for the maintenance of a health unit. Fortunately the practicing physicians in the area are in agreement with the methods proposed and, in association with the boards of health, are trying to bring the movement into an effective stage.

MORTALITY RATES

Telegraphic returns from 85 cities with a total population of thirty-seven million for the week ending November 19, indicate a mortality rate of 11.0 as against a rate of 11.1 for the corresponding week of last year. The highest rate (19.3) appears for Camden, N. J., and the lowest (5.5) for Flint, Mich. The highest infant mortality rate (16.0) appears for Bridgeport, Conn., and the lowest for Des Moines, Iowa, Duluth, Minn., Flint, Mich., Long Beach, Calif., Somerville, Mass., Tampa, Fla., Waterbury, Conn., and Yonkers, N. Y., which reported no infant mortality.

The annual rate for 85 cities is 11.0 for the forty-six weeks of 1932, as against a rate of 11.8 for the corresponding period of the previous year.—*Bureau of the Census.*

MEDICAL PROGRESS

THE PROGRESS OF NUTRITION

BY FRANCIS LOWELL BURNETT, M.D.*

I. Morbid and Vital Processes

"PRIMITIVE man in seeking nutrition for his body responded to the deep-seated and universal physiological urge which increases from appetite to hunger, and we may suppose that in responding to that urge he followed at first the habits and methods of his pre-human ancestry. It is of interest to remember that the animal phylum from which he was derived was essentially frugivorous, as are still the collateral descendants from that phylum. Yet the remains of homo sapiens so far made available for anthropological study reveal him at a stage when he was a hunter, and chiefly, though probably not wholly, carnivorous. At some point in his early evolutionary history a change in environment made, therefore, a profound change in the nature of his nutrition. There can be no doubt that this change greatly stimulated his mental development. As a hunter his success grew with his ability to produce implements which helped him to overcome the animals which he sought for food. Thus came an urge which developed both hands and brain. We may be sure that hunger preceded any aesthetic impulse in making man an artificer.

"When, at a later stage, primitive human races learned to practise agriculture, there was again a great change in the form of their nutrition, since the cereals in increasing proportion tended to replace flesh as its basal element. There are still in the world great differences in racial custom in respect to the basal foodstuffs consumed. We realize indeed that evolution has made the body capable of ample adjustments but we find that its essential demands remain qualitatively the same, and the adjustments in question, though made necessary by circumstances, may involve loss of efficiency in a race or community. It is sure that there is always a relation between the qualities of its basal foodstuffs and the effective activities of a race, a circumstance which it is of sociological and ethnological importance to recognize. During the whole of history, the needs of nutrition and the kind and amount of foods geographically available have played a great part in determining the destiny of races. Inadequacy in the supply has in some cases stunted innate capacities and led to the degeneration of a race; more generally in the past it has stimulated effort and led to migrations and wars of aggression. . . .

"We know now that conditions recognized as actual diseases develop because the supply of some minute nutritional necessity has failed, while, short of obvious disease, ill-health may depend upon a lesser degree of such a deficiency. Lack of substances of which the necessary amount is equally small may be responsible for failure of proper growth in the young, and for loss of fertility in the adult. Recent observations seem even to have shown that fundamental instincts, such as maternal care for the progeny, may, in animals at least, be affected by the absence of a factor from the diet! In all individuals such a lack may greatly increase the liability to infection by bacteria and other parasites. Facts such as these are clearly established. . . .

"Modern studies are making it clear indeed that nutritional needs are in reality very complex; so complex that the results of these studies sometimes awaken scepticism among those who have not appraised the evidence. They are conclusive, however, to those who have seen them at first-hand. To keep abreast with current gains in knowledge of this kind cannot but be profitable to a wide public apart from those who are directly concerned with research. In animal husbandry, for instance, it is still not fully recognized how much loss and failure is due to deficiency diseases or to more obscure failures in nutrition of a remedial kind. The knowledge in question is equally important for those concerned with infant welfare and other aspects of public health, and no less important for those whose duties deal with the care, the development and employment of native races throughout the Empire." (Hopkins, F. G. *Nutrition Abs. & Rev.* 1:3 [Oct.], 1931.)

The inferences of the foremost investigator of nutrition are interesting and edifying, but arouse reflections. Nutrition is a commonly used term, but what is it? A recent definition describes it as "the sum of the processes by which an animal or plant absorbs, or takes in and utilizes, food substances" (Webster's New Internat. Dict. 1924). At present, many new facts have accumulated to make this process better understood; and yet this knowledge is not entirely clear and practical. For instance, when the food of man is made adequate with the various vitamins, the essential minerals, and sufficient protein, etc., to prevent deficiency diseases; anemia, diabetes, dental caries, goitre, etc., is some kind of complex and delicately adjusted process elaborated in the body that maintains its integrity? Surely, through the effects of injurious agents, morbid processes arise in the body. In a similar way, therefore, may not the proper adjustment of food create a vital process which results in an improved state of

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well-being, or an exact state of health? If the position and structure of the digestive system in relation to other parts of the body are taken into account, such conjecture is not entirely unreasonable. For, as the digestive system forms a tube which traverses the body, food in it is merely passing through, and is not in, the body. The nutrient substances which pass through the wall of the tube are the essential consideration, for with complete and suitable food, the action of the proper intestinal functions, and potent digestive fluids, they should be normal. Once within the body, however, these substances evidently are still further reduced by the action of enzymes or hormones from the glands of internal secretion, before they are capable of forming a chemical union with the protoplasm of the cells. And then when some substances, especially the minerals, become normal in the circulation, the excess may be excreted through the intestinal wall. Such a series of mechanical and chemical actions is indeed a vital process, and may be called essential or anabolic nutrition.

On the other hand, with incomplete and disproportioned food, abnormal intestinal functions, and impotent digestive fluids, the nutrient substances may become deficient, and the vital process of essential nutrition may be replaced by the morbid process of a deficient condition. When such an invidious morbid process continues until structural changes occur in the tissues, signs and symptoms may be produced in a patient which make possible the recognition of the disease. Such a condition might not have been produced if the normal indices of absorption were applied to serve as a clue to the vital process of essential nutrition and the creation of an exact state of health. Interesting inferences on "Malabsorption in Deficiency Diseases" have already been pointed out by Burnett and Howe (*J. A. M. A.* 88:1705 [May], 1927); while recently, Castle et al (*J. A. M. A.* 97:904 [Sept. 26], 1931) have extended the point of view. "Disturbances of the gastro-intestinal tract of various kinds may interfere with absorption or with processes necessary for the proper metabolism of food substances essential for the normal functioning of the bone marrow." Consequently, it seems possible, through the recognition and practical application of these principles, to have the normal feces and intestinal rate serve as indices of normal absorption, and thus replace a morbid by a vital process, by which an exact state of health is created.

II. Food and Health

The previous description of man's food from early times suggests that as he became more intelligent he changed from a predominantly starchy diet to one containing more protein. The increased intelligence may have been the result of better health and freedom from physical disorders. In this connection, the interesting and valuable study of Orr and Gilks (Sp. Rep. Series, No. 155, Med. Research Council, H. M. Stationery Office, London, 1931) on "The Physique and Health of Two African Tribes" appears peculiarly significant. One of these tribes, the Akikuyu, ate a predominantly cereal, root, and fruit food; while the other, the Masai, consumed milk, meat, and raw blood. One diet consisted largely of carbohydrates and was low in calcium; and the other had a high protein, fat, and calcium content. The effects of the variations of nutrition were that the Akikuyu people averaged five inches shorter and twenty-three pounds lighter than the Masai, and were half as strong as recorded by dynamometer. Furthermore, the former were subject to dental caries, anemia, pulmonary disorders, and tropical ulcer, while the latter had intestinal stasis and rheumatoid arthritis. The investigators suggest that both diets might be improved by an increase of green vegetables. The food consumed by the people of a Scotch village has been described by Cathcart, in another of the Medical Research Council's publications (Sp. Rep. Series No. 151, 1931). Of the 154 families studied, the average daily consumption of food amounted to 84 grams of protein, 119 grams of fat, and 411 of carbohydrate. The work is largely statistical, and comparisons are made of similar studies in other villages; and many tables of figures give the food consumption of families, according to income, social position, and occupation, etc. A comparison has been made of the food consumed by American and German workmen by von Tyszka (*Klin. Wchnschr.* 10: 124 [Jan. 17], 1931). From this study, it was found that the American spends 32% of his income on food, and buys more beef, mutton, eggs, milk, butter, vegetables, fruits, and cereals; whereas the German spends 46% of his money to buy pork, sausage, cheese, bread, and potatoes. The food consumed by the inmates of four American prisons has been studied by Howe and MacCormick (*Am. J. Pub. Health* 21:933 [Sept.], 1931). The daily food of the prisoners varied between 4000 to 5300 calories, and was divided into 120 to 208 grams of protein, 118 to 209 grams of fat, 478 to 837 grams of carbohydrate, 0.553 to 1.10 grams of calcium, 1.50 to 1.98 grams of phosphorus, and 0.025 to 0.036 grams of iron. The calcium content of the diet was considered low. Changes in the food consumed by Americans during recent years have been observed by Sherman (*J. Home Econ.* 23:1103 [Dec.], 1931) of the U. S. Department of Agriculture. The consumption of citrous fruits and vegetables has increased especially. Ten years ago, the annual consumption of 2,436 carloads of spinach was enough for the people, but last year 10,002 carloads were used; and the amount of lettuce required has increased from 13,788 in 1921 to 55,636 carloads in 1931. The consumption of

new beets, carrots and other fresh vegetables has also increased, although the cost compared with stored or canned ones is much higher.

The research point of view in nutrition has been given by Orr (*Med. World*, May 1, 1931) in a paper on the "Development of the Science of Nutrition in Relation to Disease." He writes in part that "there are a number of diseases of which the main symptoms are due to a disturbance of the normal digestive or metabolic processes, e.g., gastric and duodenal ulcers, constipation, and their sequelae, rheumatism, anemias, high blood pressure, and cardiac and nephritic disorders". One of the outstanding investigations of the year, "On Nutrition in Relation to Immunity" is incorporated in a preliminary communication by Orr, McLeod, and Mackie (*Lancet* 1: 220: 117 [May], 1931). The first part of the study, on "two African tribes" has been summarized previously. . . . In the second part, observations were made on the morbidity and mortality of sheep consuming food from pastures under natural conditions and also from a basal ration similar to the food of the pasture, but supplemented with calcium or cod liver oil. On the latter diet the health of the animals improved and the mortality was reduced. Analysis of the food from the poor hill pasture and the blood of the animals demonstrated marked seasonal variations. In both, the calcium content was highest in July and lowest in April. At this time, too, other evidences of malnutrition were loss of weight, anemia, and lowered hemolytic and bacteriolytic reactions. "The results indicate that the natural immunity reactions of blood serum may be markedly influenced by nutritional factors which also affect the chemical composition of the blood." In the sheep fed a basal diet similar to that of the poor hill pasture but supplemented with calcium or cod liver oil, the deficiency disorders in animals generally were prevented. Changes in the serum reactions were indeterminate, though an astonishing improvement occurred in the animals' condition from the food of grassy pastures compared with that from the controlled diet of the experimental pens. Sherman (*J. A. M. A.* 97: 1425 [Nov. 14], 1931) has contributed to the subject in an article on "Some Recent Advances in the Chemistry of Nutrition." The author first alludes to vitamin G, as differentiated from vitamin B. While this vitamin is essentially a pellagra preventive factor, it is also alluded to as contributing to "buoyant" instead of passable health, and if consumed liberally, of increasing longevity. On this account, vitamin G may be a multiple instead of a simple factor. He has observed also that "optimal calcium retention in the growing child requires the joint action of a liberal provision of the antirachitic factor and a liberal intake of calcium in the food". One grain of calcium daily is a safe allowance for a young child. McCarrison (*Lancet*, 1: 1151 [May 23], 1931) has written on "Some Surgical Aspects of Faulty Nutrition." His observations are based largely on the results found postmortem from the examination of 2243 deficiently fed rats. Adenoid growths, otitis media, gastroduodenal ulcers, abnormal conditions in many of the genital organs, lymphadenoid goitre and Graves' disease were produced in these animals by various deficient diets. In another article this investigator (*Brit. M. J.* 1: 1009 [June 13], 1931) has reported "on the Causation of Stone in India". By feeding rats on a diet similar to the one consumed by most Indians in the "stone area" about the same incidence of renal stones in the animals and man was produced. Several factors predispose to the formation of stones, one positive, which includes some unknown agent in whole cereal grains and an excess of lime; and the other negative factors, which include a deficiency of vitamin A from animal food and a deficiency of phosphorus.

III. Ophthalmia, Keratomalacia, Infections, and Reproduction

A clinical study of xerophthalmia and night blindness in children has been made by Spence (*Arch. Dis. Child.* 6: 17 [Feb.], 1931). Of 4,100 patients admitted to an eye hospital in a year, seventeen had one of these diseases from a vitamin A deficiency. Night blindness was the chief and earliest complaint, but xerophthalmia with typical Bitot's spots developed in fourteen of the patients. After cod liver oil, or butter and milk were consumed for a week, the blindness decreased; after two weeks the spots began to disappear; and after two months health was restored. The after-effects of xerophthalmia in children, especially in reference to the condition of the teeth, has been observed by Bloch (*Am. J. Dis. Child.* 42: 263 [Aug.], 1931). A deficiency of vitamin A was found not to have an injurious effect on the formation and calcification of the teeth. The death-rate, however, from this disease was high, as one third of those affected succumbed before attaining eight years. In those surviving the deficiency, defects were not seen except when complicated by keratomalacia, which often caused an impairment or loss of vision. Keratomalacia as a cause of blindness in Indian children has been pointed out by Wright (*Lancet* 1: 800 [Apr. 11], 1931). Blindness from this disease was found to be far more common than ophthalmia neonatorum, syphilis, or trachoma, and to be due largely to a vitamin A deficiency. Other erroneous ways of eating may be contributing factors. The disease is effectively treated with crude cod liver oil. Disturbances of liver function were found frequently with keratomalacia, and may be the first symptom of a vitamin A deficiency. In a somewhat similar article, Field (*Malayan M. J.* 6: 46 [June], 1931) found the incidence of keratomalacia in the Indians to be much higher than in

the Malayans or the Chinese. Again the disease appeared to be due to the lack of vitamin A, as the Malayans generally ingested enough of this vitamin in the fresh natural foods derived from their own gardens. Moreover, the Indians are much more subject to other infections than the other races, as their morbidity from influenza, during the epidemic of 1918, was much higher. Frazier and Hu (*Arch. Int. Med.* 48: 507 [Sept.], 1931) record an outbreak of keratomalacia among Chinese soldiers in some of whom peculiar cutaneous lesions also developed. The lesions were characterized by an excessive epithelial keratinization which resulted in the occlusion of the hair follicles and sweat ducts and a secondary degeneration of the sebaceous and sweat glands. After a well-balanced diet of fresh vegetables, dairy products, liver, and cod liver oil was ingested, the keratomalacia rapidly improved; but the lesions of the skin were more resistant. Tansley (*J. Physiol.* 71: 442 [Apr.], 1931) has studied the regeneration of visual purple, and its relation to dark adaptation and night blindness in rats. The extraction of the visual purple from the retina was accomplished with digitonin, and the amount estimated by a photographic method. By this means, it was found that regeneration proceeded more slowly in the deficient than in the normal rats, and was also very irregular, compared with the orderly regeneration of the visual purple in normal rodents.

Observations on the common cold and vitamin A have been made by Wright et al. (*Canad. M. A. J.* 25: 412 [Oct.], 1931) in children. Twenty infants were given an excessive amount of vitamin A, while a control group of forty infants were supplied with a normal amount, and observed for several months. The incidence of nasopharyngeal infections did not differ in the two groups; and therefore the investigators concluded that the excessive administration of the vitamin was not of value in the prevention of infections. On the other hand, Green, Mellanby, et al. (*Brit. M. J.* 2: 595 [Oct. 3], 1931) continue to offer proof that a concentrate of vitamin A and D does protect women in the puerperal state from sepsis. They gave one half the 550 women observed the concentrate, while the other half, without it, and eating the same food, served as controls. Ten of the latter group, compared with four of the former, developed sepsis. Experimental evidence of the value of vitamin A as a prophylactic agent against infections in rats is offered by Turner and Loew (*J. Infec. Dis.* 49: 244 [Sept.], 1931). They found Staph. Aureus "chromogen 6" and B. Coli most frequently in the sinuses and ears of vitamin deficient and normally fed animals; but more frequent and severe lesions in the deficient animals. "Chromogen 6" is generally not pathogenic in laboratory animals, but becomes so through the lowered vital resistance of vitamin A deficiency. To compare the lowered resistance of vitamin A deficiency with that of vitamin D in rats Boynton and Bradford (*J. Nutrition* 4: 323 [Sept.], 1931) inoculated groups of these animals and adequate controls with B. mucosus capsulatus. Many of the animals with vitamin A deficiency succumbed, while the completely fed and those with D deficiency were unaffected. Wolfe and Howe (*J. Nutrition* 4: 185 [July], 1931) have produced vitamin A deficiency in the albino mouse. Xerophthalmia developed in the animals, but the earliest as well as the most pronounced lesions were found in the upper respiratory tract, where normal was replaced by keratinized epithelium. Various tests have been made with carotin, which is a crystalline fatty substance originally derived from carrots, and found to contain many of the properties of vitamin A. Indeed, Capper et al. (*Biochem. J.* 25: 265, 1931) have brought about the recovery of chickens from a staggering gait and loss of balance due to vitamin A deficiency, by the administration of cod liver oil concentrates or carotin. Moreover, very young chickens could not be reared on a food without vitamin A, but with carotin as a source of this food factor healthy birds developed.

The practical application of vitamin E to medicine has been reported by Vogt-Miller (*Lancet* 221: 182 [July 25], 1931). To several women who had four or five consecutive miscarriages, 5 cc. doses of wheat germ oil were administered. The oil was given every day for the first week, alternate days for the second two weeks, and every sixth day subsequently. The result was that each woman gave birth to a living child. Juhász-Schäffer (Virchow's *Arch. f. path. anat.* 281: 3, 1931) has confirmed the pathology of E avitaminosis in the reproductive organs of rats. In the males, atrophic changes were seen in the spermatocytes and spermatozonia early, but the spermatids and spermatozoa did not appear abnormal until late in this deficiency. Occasionally the changes in these cells were reversed. The Sertoli and interstitial cells remained unchanged. In the females, the cells of ovaries were not altered, even after prolonged vitamin E deprivation. In another study (*Ibid.* 281: 34, 1931) cultures of embryonic tissue in chicken's plasma, to which wheat germ oil was added, caused a 150% increase in growth in five days. A progressive dystrophy of the striated muscle in rabbits and guinea pigs consuming food without vitamin E has been reported by Goettsch and Pappenheimer (*J. Exper. Med.* 54: 145 [Aug.], 1931). Microscopically, the lesions resembled Zenker's hyaline degeneration. The addition of vitamin E to the food did not influence the course of the disease, which was ascribed to an unknown cause.

IV. Beriberi, Pellagra, and Nerve Disorders

A study of infantile beriberi from the examination and treatment of over 500 patients

has been made by Albert (*Philippine J. Sci.* 45:297 [June], 1931). In the Philippines the disease has not been recognized long, but in Manila during the last fifteen years, a fall in the death-rate has occurred. Commonly, it is confined to breast-fed infants whose mothers are free of the disease, and is readily cured by supplementary feedings of an extract of tikitiki (rice polishings). On the other hand, beriberi has increased in Indo-China according to the report of Cazanove (Office International d'Hyg. Publique, *Bull. Mensuel* 23:1059 [June], 1931) and is due to the increased ingestion of steamed milled rice. Here the disease is rare in infants but common in pregnant and recently confined women. Dietary treatment is generally effective. In Hongkong, Sydenham (*Brit. Med. J.* 1:640 [Apr. 11], 1931) has reviewed the disorders of 1600 pregnant women over a period of four years, and found that only ten were afflicted with beriberi. The disease is rarely seen except as a complication of pregnancy. Aalsmer (*Wien. Arch. f. Med.* 21:1 [Jan. 20], 1931) has recorded changes in the vascular tone and a lowering of blood pressure as early signs of active beriberi. Subsequently, the edema, enlargement of the heart and nerve disorders are valuable signs in making a definite diagnosis. A five-fold increase of vitamin B in bread from yeast is thought by Krogh (*Ugeskr. f. Laeger.* 93:592, 1931) to have a beneficial effect on some of the Danish people. Such an increase will give an adequate amount of vitamin B if 580 gr. of bread are consumed daily. By testing the bread experimentally, it was found to cause a larger increase in the weight of mice and rats than ordinary wheat bread. Similarly, Hoobler (*J. A. M. A.* 96:675 [Feb. 28], 1931) has added wheat germ or yeast to modified milk-fed infants, and found a gain in stature without an increase of weight.

A comprehensive review of the assay, distribution and physiology of vitamin B, from experimental and chemical aspects, has been published (*Nature*, 127:95, 127 & 204, 1931). To determine the quantity of vitamin B in a food, the amount necessary to cure a pigeon of polyneuritis is the one used by most investigators. Some crystals have also been obtained from rice polishings, which, according to the standard of the "pigeon day doses" varied between 0.01 and 0.0028 mgs. Attempts to separate vitamin B from G in a more or less pure form from yeast involve complex chemical procedures. Cowgill (*Am. J. Physiol.* 96:372 [Feb.], 1931) and his associates have determined that anorexia in dogs, the earliest sign of vitamin B deficiency, is due to a lack of vitamin B independent of G. The polyneuritis of pigeons can be cured by the administration of dried liver, kidney, muscle, or brain of normally fed birds, according to Abderhalden (*Pflüger's Arch.* 226:723, 1931).

A brief history of pellagra in the United States has been written by Wheeler (*U. S. Pub. Health Rep.*, 46:2223 [Sept. 19], 1931). The intent of the author is to prove that the disease existed here before the "explosive outbreak" of 1907-1918; and from the replies to letters from elderly southern practitioners and the records of asylums, it appears that pellagra occurred here as early as 1885, but because the disease was not described in many early textbooks of medicine, and others described it as an Italian disease, it was not accurately diagnosed. The outbreak of 1907 might be due in part to better diagnoses; but also to a change in dietary habits of the Southern people from growing cotton at the expense of food and forage crops. The outbreak of pellagra in a hospital for lepers at Deccan, India, has been reported by Lowe (*Indian Med. Gaz.*, 66:491 [Sept.], 1931). The disease appeared in December, gradually increased until March, and then subsided. The age and sex incidence, the early symptoms, and objective signs are described. The food was found deficient in protein, fat, and minerals; and in treatment meat, milk, vegetables, and fruit were added. From a study of forty patients, the author considers pellagra a deficiency disease. Two patients with pellagra have been reported by Kinner (*Wein. Klin. Wchnschr.*, 44:849 [June 26], 1931). They ate maize but twice a week, but both were drunkards; and this fact undoubtedly caused a deficiency of food. Pellagra secondary to lesions and malfunctions of the digestive system in thirteen patients has been reported by Eusterman and O'Leary (*Arch. Int. Med.*, 47:633 [April], 1931). Some of the patients had pyloric obstruction from tumors or ulcers, several had disorders of the intestinal functions from unnecessary operations, and gastric syphilis, carcinoma of the colon, and ulcerative colitis also are recorded. The cure of the disease under these circumstances is surgical, as the obstructions and lesions must be removed.

A comprehensive case report of lesions of the central nervous system characteristic of pellagra has been made by Langworthy (*Brain*, 54:291 [Sept.], 1931). The patient had symmetrical skin lesions, sore tongue, diarrhea, and mental and neurological symptoms characteristic of pellagra. She became greatly emaciated and died. On postmortem examination, tuberculosis of the lungs and intestines were discovered. Lesions of the nervous system were diffuse. Pigment was found in sensory and autonomic ganglia, and lesions in the anterolateral columns, and especially in the spinocerebellar and corticospinal tracts. In a series of articles Turner (*J. Clin. Invest.* 10:61, 71, 87, 99, & 111 [Apr. 20], 1931) has described "The Pathologic Physiology of Pellagra." Observations were made and recorded on the clinical and physiological data, the serum albumin and

globulin, the serum calcium and phosphorus, serum electrolytes and acid-base equilibrium, and the circulating blood volume. Another study of the blood in pellagra has been contributed by Anding and Sinani (*Arch. f. Schiff. und Tropen. Hyg.*, 35:171 [March], 1931). Comprehensive examinations made of twelve patients revealed a low hemoglobin content, corpuscle counts from 2,500,000 to 4,000,000 cells, and a color index of about 1. A marked change in the shape or size of the corpuscles was not apparent, and the leukocyte count was generally low, at about 3,000. The fragility of the corpuscles and number of platelets were not abnormal; the coagulation time was a little reduced, and the serum protein somewhat diminished.

The pathology of vitamin G deficiency in rats has been studied by Thatcher et al. (*Arch. Path.* 11:425 [March], 1931). The animals not only ceased to grow, but lost weight, ophthalmia occasionally developed, and the urine became chromogenic. Besides these signs, alopecia and ulceration of the skin, atrophy of the spleen and thymus gland, fatty changes in the liver, and congestion of the intestines also occurred. Ringrose et al. (*Poultry Sci.* 10:166, 1931) have observed a pellagra-like syndrome in chickens. The disease develops at an early age and gives rise to a high mortality. Sure et al. (*Proc. Soc. Exper. Biol. and Med.* 28:498,1930-1931) have found that when rats without vitamin G develop dermatitis they are also anemic. At present, however, the view that vitamin G is the significant factor concerned in the prevention of pellagra has been challenged. Such a challenge has been written by Guha (*Brit. Med. J.* 2:53 [July 11], 1931) and even more forcefully by Gurin and Eddy, with the assistance of Denton (*J. Exper. Med.*, 54:421 [Sept. 1], 1931). To support this contention, the assertion is made that a dermatitis resembling human pellagra histologically has occurred in rats with sufficient vitamin G to produce good growth, and that rats without vitamin G also develop a dermatitis which is dissimilar histologically to pellagra or black tongue.

V. Scurvy and Skin Disease

Scurvy not infrequently occurs in the natives of South Africa, especially during a severe drought, and Ross (*J. Med. Asso. South Africa*, 5:596 [Sept. 26], 1931) has reported the study of 208 patients. Of this number sixty were men between the ages of 20 and 80, all of whom recovered; thirty-three were women of a similar range of age, all of whom recovered; thirty-six were young children between 4 and 14 years, of whom one died; seventy-seven were young children under three years, of whom eight died; and two were infants, who recovered. One infant and mother acquired the disease. The high incidence in young children is evidently the result of feeding on maize porridge, maize water, and maize, supplemented at times with bread and tea but without milk. Extreme edema was the most striking feature of the infantile type of the disease. The ingestion of lemon juice was generally curative. A few cases of this disease have been recorded. In a child reported by Abels (*Wien. Arch. f. inn. Med.* 21:473 [July 15], 1931) the chief symptom was extreme sleeplessness. Various sedatives were used without relief. Subsequently, a slight hemoglobinuria developed, latent scurvy was diagnosed, and through the administration of large amounts of vitamin C, recovery took place. In an infant reported by Bjerino (*Ugeskr. f. Laeger*, 93:129, 1931) the scurvy was relieved by the use of "Stassanized" milk, which was the only source of vitamin C. An interesting and perhaps valuable test for a prescorbutic condition in children has been devised by Göthlin (*Scand. Arch. f. Physiol.* 61:225 [May], 1931). The test is dependent on the strength of the cutaneous capillaries, and is applied by a compression of the upper arm with 50 mm. of mercury for fifteen minutes. At the end of this time, if more than six petechiae are apparent the person is thought to have a lowered capillary resistance. The resistance may be increased by the adequate ingestion of vitamin C. The amount necessary for one individual was found to be 1 cc. of orange juice per kg. of body weight, and in another 0.7 cc. was required. According to the number found positive to the test "vitamin C. deficiency" is by no means rare in Sweden.

An unusual opportunity for the study of scurvy was presented to Howitt (*Arch. Pathol.* 11:574 [April], 1931) by the spontaneous development of the disease in monkeys. During the voyage from India the animals were fed on unhulled rice and dried beans, and on reaching a laboratory appeared healthy. Here they were given a diet low in Vitamin C to prevent dysentery. In two weeks, one of the animals developed typical scurvy, and on examination of the others many were found to have bleeding gums, some cranial swellings, a few swollen joints, and a few, other signs. From these observations the diet was changed; sunflower seed and orange juice were given daily, rice and barley on alternate days, and fresh cabbage, carrots, and bananas every few days, with the result that thirty-six of the animals recovered, and only three died. Postmortem examinations of these monkeys generally showed emaciation, bleeding gums, subperiosteal hemorrhages of some of the long bones and skull, petechial hemorrhages in some of the viscera, enlarged heart with atonic muscle, and a soft, spongy spleen. The hemorrhagic diathesis of experimental scurvy in guinea pigs has been observed by Dalldorf (*J. Exper. Med.* 53:289 [Feb.], 1931). The degree of negative pressure required to produce petechial hemorrhages was found to fall during the first week of the deficient diet, rose again

during the second week, and steadily declined afterward. The administration of vitamin C made the vessels more resistant, the degree varying with the amount of the essential food given. Humphreys and Zilva (*Biochem. J.* 25:579, 1931) have determined the absorption and retention of calcium and phosphorus in scorbutic guinea pigs, and found that the retention of these elements was not lowered until the animals became in extremis. At this time, too, all of the metabolic processes were affected. On the other hand, from the studies of Salter and Aub (*Arch. Path.* 11:380 [March], 1931) when the food of guinea pigs contains adequate calcium but is deficient in vitamin C, calcium is not deposited in the bones. If the food is more complete, a rapid deposition of calcium in the epiphyses and trabeculae occurs.

The value of a milk free diet in the treatment of infantile eczema has been recorded by Hill (*J. A. M. A.* 96:1277 [Apr. 18], 1931). As a substitute for this essential food, a mixture of 67.5% soy-bean flour, barley flour 9.5%, olive oil 19%, sodium chloride 1.3%, and calcium carbonate 2.7% was used. Occasionally, when the skin tests for the proteins of milk were negative, evaporated milk was given, but the improvement was not so rapid or striking. Krauss (*J. Med. Soc. New Jersey* 28:217 [Mar.], 1931) has reported a similar experience in the use of soy-bean milk in the treatment of infantile eczema. On the other hand, Hopkins et al. (*J. Allergy*, 2:239 [May], 1931) have described the use of elimination diets as an aid in the diagnosis and treatment of eczema. By this means, the patient's food may be very much restricted in diet 1, somewhat in diet 2, and a more liberal variety allowed in diet 3. The patients are generally given the restricted diet for several weeks and the outcome observed. Later a less restricted diet is allowed. Skin tests may be valuable to determine some of the offending foods. Of the 112 patients studied, promising results were obtained by the elimination diets. The successful treatment of eczema, angioneurotic edema and urticaria has been described by Brown (*Southwestern Med.*, 15:261 [June], 1931.) Some of the measures recommended are to reduce greatly the foods excessively consumed by the patients and to replace them with more wholesome kinds thoroughly cooked. The food also must be thoroughly masticated, and irregular or excessive eating avoided. The administration of citric acid is aften a valuable adjunct to improve digestion. The dietary treatment of lupus and other skin diseases has been studied by Stumpke and Mohrmann (*Medizin. Klin.* 27:235 [Feb. 13], 1931). The so-called salt free diet of Gerson-Sauerbruch-Hermannsdorfer generally was used with about twenty patients. Ten of the thirteen patients with lupus improved; the other patients had other kinds of treatment besides the diet, and therefore a definite conclusion in regard to the value of the food could not be reached.

Levin and Silvers (*J. A. M. A.* 96:2190 [June 27], 1931) report the occurrence of carotinemia and a discoloration of the skin in two patients, from a rather restricted diet of oranges, carrots, and other vegetables. The yellow discoloration of the skin disappeared after foods containing carotin were avoided for a few months. A good experimental investigation has been carried out by Pillsbury (*J. A. M. A.* 96:426 [Feb. 7], 1931) on the intrinsic carbohydrate metabolism of the skin. The lactic acid content of weighed pieces of rabbit's skin (removed under local anesthesia) was determined when the animals were starved, when they were well fed, and after the parenteral injection of 3 gms. of dextrose per kilogram of body weight. The skin of the starved animals was found to contain from 40-60 mgs. of lactic acid per 100 gms. of skin, and that of well-fed rodents from 70-140 milligrams. The skin removed after the dextrose injections was incubated in sodium bicarbonate and this procedure generally doubled the lactic acid values. Even so, the skin was found to store a large amount of dextrose; as the lactic acid value before the injection varied from 164 to 176 mgs., while afterward it rose and varied from 252 to 398 milligrams.

VI. Rickets, Osteomalacia, Dental Decay, and Arthritis

The clinical significance of craniotabes and its connection with rickets has been experimentally studied by Jundell (*Acta Paediat.* 12:1, 1931). One hundred pregnant women were given 30 cc. of cod liver oil daily for two months, and another group of twenty-seven, 10 gtt. of vigantol daily for a similar period. After delivery, these vitamin D preparations were added to the food of the infants. Seventy-nine babies of untreated mothers of the same social position and nutritional requirements were observed also as a control group. All of the infants in the three groups were examined monthly for marked softening of the superoccipital region. From these observations 65% of the infants having antirachitic treatment were found to develop craniotabes and 30% of these also had rachitic changes in the chest, while only 58% of the control group had craniotabes and a similar percentage deformities of the thorax. Craniotabes, therefore, is not considered a lesion of rickets. An interesting study has been made by Kloster (*Acta Paediat.* 12:1 [Sept. 3], 1931) on the frequency and distribution of rickets in children living in a fishery district of the Arctic circle, where the sun is obscured for two months of the year. Norwegians, Finns, and Lapps inhabit this district. Of the 376 young children between two and seven years, 43% were found to have rickets, while of 451 older children, only 13% had the disease. The in-

cidence of rickets was found to be highest in the spring, and especially in those born during the previous fall. Breast-fed fared better than bottle-fed babies. A significant difference was not found in sex, heredity, or race, except in so far as dietary habits and ways of living were concerned. This favored the Lapps, for the women and children of this race, being clothed in reindeer skin were out-of-doors most of the time. In addition, these people consumed large quantities of fresh fish, which was served with 70 gms. (per head daily) of liver oil and fresh liver. On the other hand, in the well-to-do Finns, who were able to and consumed meat and milk, the incidence of the disease was the highest.

The pathogenesis of the various forms of rickets in children has been described by Bloch and Faber (*Acta Paediat.* 10:10, 1931). In normal children the calcium of the serum was found to vary between 10.1 and 11.1 mgs., while the phosphorus varied between 5.6 and 7.1 mgs. per 100 cc. of blood. Of 71 rachitic children, six had a low phosphorus with a normal calcium, 52 had low values of both elements, and 13 a low calcium and normal phosphorus. Uncomplicated rickets was found in the first group, in about half of the second the disease was accompanied by tetany, and in the third all had convulsions. In fact, in all of the patients, if the calcium was reduced below 8.2 mgs., tetany occurred. In addition patients with a low phosphorus showed severe rickets, while those with normal phosphorus and low calcium showed osteoporosis without pronounced deformities. The effect of antirachitic agents on the leukocytes of children has been reported by Gyllensward and Jundell (*Acta Paediat.* 10: 401, 1931). The work was carried out to determine whether the human cells were changed as were those of mice, rats and guinea pigs from cod liver oil. An exact comparison of the blood from treated and untreated children failed to show a difference.

By the use of viosterol (100D) given to premature infants May (*J. A. M. A.* 96:1370 [Apr. 25], 1931) has been able to prevent rickets. From forty to sixty drops of the preparation were given daily for about two months, after which the dose was reduced one half. Injurious effects were not apparent. Rau and Gruber (*Munch. Med. Wchnschr.*, 78: 274 [Feb. 13], 1931) made a comparison of the value of irradiated milk and vigantol in the treatment of rachitic children, and found that both might be successful, but healing occurred much more rapidly with vigantol. The irradiation of milk in an atmosphere of CO_2 has proved to be a reliable antirachitic agent, as reported by Scheer (*J. State Med.* 39:607 [Oct.], 1931). One half a pint a day was served to prevent rickets in children, and, when nursing mothers drank one pint a day, the infants did not develop the disease.

The excessive ingestion of cod liver oil and other vitamin D preparations may have an injurious effect on patients. A fatal case of hypervitaminosis D has been reported by Thatcher (*Edinburgh Med. J.* 38:457 [Aug.], 1931). A boy of eighteen months was admitted to a hospital suffering from general weakness and anorexia, and also was much under weight. On examination, pyelonephritis was found, but no signs of rickets. For many months previously the child had been taking twice the amount of a curative dose of irradiated ergosterol. Little could be done for him in the hospital; he became weaker and died. In a postmortem examination, deposits of calcium were found in the kidneys. Besides deposits of calcium in the organs, hypervitaminosis D also causes degeneration of the heart muscle and especially the bundle of His. To determine this point Jundell and Stenstrom (*Acta Paediat.* 12:113, 1931) made electrocardiograms of some normal infants, others with mild infectious diseases, and some receiving antirachitic treatment. The infected infants and those receiving 15 cc. of cod liver oil, 9-25 gtt. of vigantol, the emulsion of cod liver oil, or irradiated egg yolk for some time, showed a decreased conductivity of the arterioventricular bundle and the ventricular muscle. On this account the authors feel that the antirachitic agents have a toxic effect on the heart muscle, and advise the use of minimum amounts of these substances.

Experimental evidence from the lesions found in animals with hypervitaminosis D also points to the toxic effect and calcareous action of the antirachitic agents. Agduhr and Stenstrom (*Acta Paediat.* 10:167, 1931) have continued their study of the injurious effects of cod liver oil. By means of the electrocardiogram of a few shotes and calves, decreased conductivity of the muscles was observed according to the degree of hypervitaminosis. A histological examination of the heart also showed a degeneration of the muscle and especially the bundle of His. As the degree of degeneration did not always correspond to the amount of oil given, the absorption was determined in a few rats, rabbits and dogs, but evidence of malabsorption was completely lacking. Proof of the injurious effects of hypervitaminosis D in chickens is also contained in the excellent report of King and Hall (*Canad. M. A. J.* 25:535 [Nov.], 1931). Large doses of viosterol produced anorexia, loss of weight, extreme emaciation, and finally death. On examination, large deposits of calcium were found in the kidneys. The matrix in the trabeculae of the femurs appeared normal, but suggested poor calcification. In chemical tests of the bone, the calcium and phosphorus were found normal. On the other hand, doses of parathormone did not produce ill effects in the chickens, and the examinations of the femurs showed productive fibrosis of the bony trabeculae, without evident deposits of lime salts in the hyperplastic tissue.

Osteomalacia, or late rickets, has generally become recognized as of deficiency origin, and Wilson (*Lancet* 2:10 [July 4], 1931) has reported several interesting and valuable points in regard to the disease. In the Kangra district of India, osteomalacia occurs most often among Chumars. The food of these people is not only deficient quantitatively and qualitatively, but is also greatly overbalanced with cereals. In the next higher class the incidence and severity of the disease were diminished, while the Gurkhas, who were able to buy fats, milk and vegetables, were generally free of the disease. Patients given adequate amounts of vitamin D improved slowly, but additional foods containing vitamins A and C, and daily exposure to the sunlight brought about rapid improvement. The disease was also observed in the Kashmir district, where adolescent and pregnant women were most often afflicted. In all patients with spasmophilia, healed rickets or a slight degree of osteomalacia were found. An examination of the blood of some pregnant women with this disease showed an anemia; but more particularly low calcium and phosphorus values, the former being reduced to 8.2 mgs., and the latter to 1.7 mgs. to 100 cc. of blood. The ingestion of complete food not only relieved the disease but raised the amount of these elements to normal.

Interesting observations have been made by Agnew and Agnew (*J. Dent. Res.* 11: 478, 1931) on the relation between the dental caries and food among the aboriginal people of the Tibetan borderland. Cavities were found in 39% of the "Chiang" adult tribesmen, and 33% of the children, whereas 42% of the adults and 45% of the children of Chinese origin had caries. Mild gingivitis or severe ulceration of the gums were common in all the people of this district, and diseases of the eyes were prevalent also. Foods composed of whole yellow corn, supplemented with a few vegetables were consumed and therefore the diet was deficient in vitamins A and D, but the mineral and other vitamin content was considered sufficient. In the city of Chengtu, 70% of the children had caries and this was ascribed to the additional consumption of sweet foods. In England, the Committee on Dental Disease has issued a report on the influence of diet on children's teeth (Med. Res. Counc., Sp. Rep. Ser., No. 159; His Majesty's Stationery Office, London, 1931). In this investigation, bi-yearly examinations were made for two years of the deciduous and permanent teeth of children living in institutions. In order to determine the spread of dental caries from variations of nutrition, the children of each of three institutions were divided into three groups. One group, in addition to a well-balanced diet, was given supplementary feedings of molasses; the second on the same diet had olive oil added to the food, and the third, consuming a similar diet, had it enriched with cod liver oil. In another series of observations carried out in a similar way, one group of children received olive oil, while the other received olive oil containing radiostol. The results obtained were that a marked decrease was found in the spread of dental caries, in the permanent teeth especially, in the children receiving cod liver oil and radiostol. In an examination of the teeth of sixty-four blind children as a result of xerophthalmia, reported by Bloch (*Am. J. Dis. Child.* 42: 263 [Aug.], 1931), dental caries was not very evident. The author assumes therefore that vitamin A is not a factor in the formation of sound teeth. Practical nutritional suggestions to prevent dental caries have been noted by Howe (*J. Am. Den. Asso.* 17: 2140 [Nov.], 1930). The suggestions are based largely on the results of animal experimentation, especially in vitamin A, C, and D studies. In conclusion he states, "for sound teeth formation and subsequent tooth integrity, the wider use of milk, fruits, and vegetables should be advocated".

Toverud and Toverud (*Acta Paediat.* 12: 116 [Sept.] 2, 1931) have reported valuable studies on the mineral metabolism during pregnancy and lactation and its bearing on the disposition to rickets and dental caries. On the supposition that the Ca and P balance was low during the last few months of pregnancy, and during the period of lactation of women, they carried out some experiments on dogs. In bitches given a diet low in Ca, P, and vitamins A and D, the blood was found to be low in these elements, tetany occurred during lactation, and changes in the bone resembling osteomalacia were found. At birth, the puppies also had diminished Ca and P in the bones and subsequently developed severe rickets and poorly calcified teeth. One pregnant bitch given a diet deficient in Ca and P alone showed less severe changes in the bones, although in her puppies osteoporosis and a slight degree of rickets were apparent. From these observations the investigators conclude that preventive measures against rickets and caries should be started in fetal life. The diet of pregnant women should contain eggs, fresh fruit, many vegetables, and a litre of milk daily and in the winter months additional foods containing vitamin D. An ingenious method of studying tissue intravitam has been reported by Wilton (*Acta Path. et Microbiol. Scand.* 8: 258, 1931) from observations on the teeth of scorbutic and rachitic guinea pigs. At intervals during the deficient diet, portions of the incisor teeth were cut off and examined histologically. In health, the odontoblasts were found to form at the base, develop into columnar cells, and finally atrophy and disappear at the crown of the teeth. In scurvy, the odontoblasts were found to reach a more advanced stage of their life cycle for a

given displacement. Changes in the guinea pigs' teeth in scurvy and old age resemble osteogenesis imperfecta of man, which is generally considered to be fetal scurvy. A valuable and carefully executed piece of work has been done by Becks and Ryder (*Arch. Path.* 12:358 [Sept.], 1931) on "Experimental Rickets and Calcification of Dentin." Young rats on a rachitogenic diet show a failure of calcification in one week and an atrophy of the odontoblasts in two weeks. The atrophy of these cells appears to be the cause of the failure in the construction of dentin, as the cells form Tome's processes, which convey nutrition to this essential substance. Moreover, from this fact, the rachitic changes in the long bones are likely to be due to a similar change in the osteoblasts.

In the light of the increasing knowledge of nutrition, the consideration of arthritis as a deficiency disease may not be altogether unreasonable. At present the term of deficiency suggests avitaminosis, but the use of the term in a more general sense might imply the failure to build bone, the loss of cartilage, or, indeed, the formation of the osteoid spurs that characterize the pathological lesions of the rheumatic affections. In fact, Pemberton (*Arthritis and Rheumatoid Conditions,* Lea & Febiger, Phila. 1929, p. 246) has written that "there are probably few other disease states in which belief in the value of some sort of diet has longer been current than in the case of rheumatism". An enterprising investigator accepts the deficiency theory, adjusts the food of patients with arthritis, and observes the results. These results are described in the article by Howitt and Christie (*Lancet* 2:1282 [Dec. 12], 1931) on "The Malnutrition Factor in Rheumatoid Arthritis." The diet advocated was one of high caloric value with an increased fat but moderate protein and carbohydrate content, supplemented with additional drinks of "creamy" milk, and injections of insulin to ensure complete carbohydrate metabolism. Enforced mental and physical rest were employed, and also systematized physiotherapy. In the twenty patients treated, encouraging results were obtained. On the other hand, in a study of the "Dietary Treatment in Arthritis" by Strauss (*Klin. Wchnschr.* 10: 199 [Jan. 31], 1931), the food has been generally limited. The purpose of the reduction is to combat obesity. Little fluid is allowed and salt is generally left out of the food of patients with an exudation. Abstinence from meat is advocated for those having the carnogenic type of arthritis. Colonic changes in arthritis have been observed by Dickson (*Ann. Intern. Med.* 5:408 [Oct.], 1931). By means of a barium meal examined with the x-ray at six, ten, twenty-four, forty-eight, and seventy-two hours after ingestion, and barium enemata, evidence of hypermotility was not often apparent. The cecum was generally found in a low position, the ascending, transverse, and descending portions of the colon were elongated and festooned, and the most striking feature of the examinations was the indefinite or absent haustral marking. After a high vitamin diet had been consumed for a month or more, a reëxamination of the colon showed an improved tone. The feces of patients with arthritis have been examined by Monroe and Hall (*Arch. Int. Med.,* 47:764 [May], 1931). The outstanding features of 142 examinations were a poor digestion of starch in 79%, iodine-staining organisms in 90%, and a positive fermentation test in 83%, whereas, in a comparison of these specimens with 97 specimens from patients with other diseases, only 27% showed a starch indigestion, 22% the iodine organisms, and 24% a positive fermentation test.

VII. Anemia, Nephritis, and Protein Metabolism

Under the title of "Nutritional Anemia" in the *Lancet* (1,221:409, 1931) the importance of malnutrition in the genesis of disease has been emphasized. Pernicious anemia is described as due to the lack of a substance which is elaborated from animal protein by normal gastric juice. Simple achlorhydric anemia is considered due to the deficient absorption of iron. Sprue is described as due to the malabsorption not only of iron, but also of fats, calcium and the vitamins. In considering the etiology of anemia, Castle et al. (*J. A. M. A.* 97: 904 [Sept. 26], 1931) have described the influence of disorders of the digestive tract, and have come to the following conclusion. "In general, disturbances of the gastro-intestinal tract of various kinds may interfere with absorption or with processes necessary for the proper metabolism of food substances essential for the normal functioning of the bone marrow. In this way even in the presence of normal diet, disturbances of the digestive tract may condition a deficiency of nutrition, in particular in substances essential for blood formation." The regeneration of tissue in pernicious anemia from liver treatment has been observed by Fahr (*Deutsche med. Wchnschr.* 57:8 [Jan. 2], 1931) in postmortem examinations of patients dead of intercurrent disorders. Observations of the bone marrow, liver and heart revealed normal conditions, and subacute combined degeneration of the cord and other changes were not considered due to malnutrition, but toxemia. In a few cadavers which showed the lesions of pernicious anemia after liver treatment, the treatment was not considered good. The examination of the marrow by sternal puncture in pernicious anemia is regarded as an important diagnostic procedure by Barta (*Deutsches Arch. f. klin. Med.* 171:565, 1931). By this means, the first result observed from liver ther-

apy is a recession of the megaloblastic corpuscles, but changes in the blood are not correlated with the clinical symptoms.

Strauss, Taylor and Castle (*J. A. M. A.* 97: 313 [Aug. 1], 1931) report good results in the treatment of pernicious anemia by the intramuscular injection of "fraction G" liver extract of Cohn and Minot. Six patients with pernicious anemia were given massive doses of liver extract by Connery (*J. A. M. A.* 97: 605 [Aug. 29], 1931) and the reticulocytes responded in the customary time. The large amount of 30-50 vials of the extract administered made some of the patients vomit. Brower and Simpson (*Am. J. Med. Sci.* 182: 319 [Sept.], 1931), Snapper and du Preez (*Arch. Int. Med.* 47: 771 [May], 1931) Conner (*J. A. M. A.* 96: 500 [Feb. 14], 1931), and Wilkinson (*Brit. M. J.* 1: 85 [Jan. 17], 1931) have confirmed the value of the administration of defatted hog stomach to patients with pernicious anemia. Barnett (*Am. J. Med. Sci.* 182: 170 [Aug.], 1931) removed the gastric juice with the aid of histamine from two patients cured of anemia, used it to digest beef, and this was fed to a third patient with pernicious anemia. The treatment caused a marked regeneration of the corpuscles. A comparison of the fragility of normal corpuscles with those of pernicious anemia has been made by Deutsch and Wagenfeld (*Deutsches Arch. f. klin. Med.* 171: 73, 1931). After the transfusion of normal blood belonging to one group into a patient with pernicious anemia belonging to another group, the anemic corpuscles were found to be much more rapidly destroyed than the normal. The amount of liver extract and other substances required to prevent a recurrence of pernicious anemia has been studied by Bebe and Lewis (*Am. J. Med. Sci.* 181: 796 [June], 1931). Of 108 cases of this disease, 64 remained normal on small amounts of liver in some form, 31 required large amounts, 5 remained sub-normal on very large amounts of potent extract, and 8 reached a normal level only when iron was added to their liver therapy. Crane et al. (*Am. J. Med. Sci.* 180: 803 [Dec.], 1930) have made a study of the effect of liver extract on the blood of normal persons and found a slight rise in the reticulocytes and a small increase of the corpuscles, hemoglobin and iron. Symptoms or signs of polycythemia were not produced, and evidence of hemolysis was entirely lacking. Ungley (*Lancet* 2: 63 [July 11], 1931) has tried the effect of a diet of brain tissue in pernicious anemia and has found it effective but much less so than liver in the regeneration of corpuscles. The diet may be as potent as liver in the treatment of subacute degeneration of the spinal cord.

A comprehensive report of a study on "Nutritional Anemia in Infancy" has been published by Mackay (Med. Res. Counc. Spec. Rep. Ser. No. 157, H. M. S. O., London, 1931). Iron in the form of iron and ammonium citrate, was added to dried milk powder, and administered in doses from 4½ to 9 grains a day. In infants given this food, the anemia was cured or prevented, the rate of growth considerably improved, and the resistance to infection raised. The hemoglobin level was maintained at about 77%, compared with 65% of a control group. Breast fed infants gave the same hemoglobin values as the control group, and the administration of iron to mothers during pregnancy and lactation did not improve the hemoglobin values of the infants. The administration of iron and copper or egg yolks to normal infants, according to the observations of Daniels and Forman (*Proc. Soc. Ex. Biol. and Med.* 28: 431,1930-1931) were not significant. Liver produced a very slight increase in the hemoglobin values of the infants. On the other hand, in the anemia of children, Lewis (*J. A. M. A.* 96: 1135 [April 4], 1931) has found that iron alone was valueless; but with the addition of copper brought about a rapid increase in the number of erythrocytes and only a moderate increase in hemoglobin.

An investigation has been carried out by Kern (*Ann. Int. Med.* 5: 729 [Dec.], 1931) on "Diet as a factor in the Etiology of Anemia." Only a few patients were studied, but the histories and examinations were thoroughly worked out. The patients had been afflicted with indigestion for many years, had gradually limited their food to relieve discomfort, and were endeavoring to nourish their bodies on very restricted diets. The food, devoid of iron, the vitamins and hemoglobin building elements, consumed for a long time, caused a secondary, a chloro-anemia. A valuable point of view has been presented by Keefer et al. (*Arch. Int. Med.* 47: 436 [March], 1931) from the study of anemia associated with chronic dysentery in sixteen patients. The food consumed was generally devoid of meat, fish, eggs, and milk and therefore consisted largely of cereal food and vegetables. On examination, these patients were found to have a very low hemoglobin, with an average of 35%, corpuscle counts from 1-2,000,000 cells, an atrophy of the lingual papillae, gastric anacidity, and changes in the nervous system. Blood regeneration occurred from liver therapy. All of these features of the disease are typical of pernicious anemia. The authors conclude that "the cause of anemia is not always the same, but the most important factors are the nutritional disturbances that result from faulty diet and a process that interferes with normal nutrition.

Minot and Castle (*Ann. Int. Med.* 5: 159 [Aug.], 1931) have described "The Adequate Treatment of Anemia", in which the authors emphasize that the cure of "pernicious anemia is accomplished not by liver, kidney, stomach, brain, or potent preparations obtained from those organs, but by *enough* potent material, irrespective of the source, for the given individual

throughout life. . . . The principles of the adequate treatment of anemias that respond to iron are essentially the same as those set forth for pernicious anemia." The results of a study of the treatment of secondary anemia in 126 patients have been published by Keefer and Yang (*Arch. Int. Med.* 48:537 [Oct.], 1931). A slight anemia due to hemorrhage may be rapidly improved by the administration of liver and iron, but if severe the transfusion of blood should be carried out. Anemias associated with deficiency diseases should be cured by well-balanced food. In these, too, iron and liver may be helpful. Those associated with chronic dysentery are very similar to the pernicious type and respond to liver extract. Finally, in those occurring during pregnancy, with the hookworm or associated with kala-azar, one or all of the blood regenerating measures may be useful. Murphy and Powers (*J. A. M. A.* 96:504 [Feb. 14], 1931) have extended their observations on treatment of anemia. With a means to determine the iron of patient's blood, their observations are valuable. In this case the deficiencies due to chronic hemorrhage or chronic chlorosis respond favorably to the administration of ferrous carbonate or liver in conjunction with iron. Liver extract is not valuable in the treatment of these anemias. An interesting study has been carried out by Mettier and Minot (*Am. J. Med. Sci.* 181:25 [Jan.], 1931) on the value of iron in blood regeneration in secondary anemia according to the reaction of the gastroduodenal contents. To determine this point, the response of the reticulocytes was observed following the ingestion of an alkaline or an acid beefsteak meal, supplemented with the same doses of iron. The reticulocytes responded to both measures, but more rapidly when the pH of the duodenum was low with the acid than high with the alkaline meal.

Many interesting experimental investigations have been carried out on the value of foods and mineral elements in the regeneration of blood in anemic animals. Beard, Myers and their associates (*J. Bio. Chem.* 94:71, 89, 111, 117, & 135 [Nov.], 1931) have made extensive studies on the milk anemia of the rat as influenced by many factors. In one, on the effect of iron ($FeCl_2$) on blood regeneration, the investigators found that 2 mgs. of the salt a day was the most effective dose, as the cell and hemoglobin recovery occurred in two weeks. A dose of 0.5 mgs. of the salt a day required six weeks for recovery. In another, the supplementary action of many other metals was studied. Iron combined with copper, nickel, mercury, zinc, arsenic, etc., reduced the time of recovery one half that of iron alone. Cobalt, magnesium, and aluminum with the iron were found ineffective. In a third study in the prevention of anemia by means of inorganic elements, they found that 0.25 mgs. of iron a day prevented the development of anemia and produced a reticulocyte peak of 15-45% of the corpuscles in four days. The addition of Cu, Mn., As, Ge, Ve, or Zn to the iron did not influence the reticulocytosis. In other investigations, polycythemia and hemoglobinemia were produced in normal animals by the administration of different elements, and blood regeneration and growth were studied from their effect of inorganic elements.

Variations of food have been observed to influence the functions and structure of the kidneys. In this connection, Lyon et al (*Edinburgh M. J.* 38:87 [Feb.], 1931) have made an exact study of the effects of acid and basic diets on a few patients with chronic nephritis. The diets contained about 81 gms. of protein, 106 gms. of fat, and 206 gms. of carbohydrate. One acid diet was composed chiefly of fish, eggs, bread, and cereals; another, called the purin diet, had a higher acid value and was made up of meat, liver, kidneys, and sweetbreads, and the basic diet consisted largely of foods composed of milk and vegetables. Tests of the CO_2 combining power, N. P. N., and urea nitrogen of the blood and the nitrogen, urea, creatinine, chlorides, calcium, and acidity of the urine were made before and after each patient had consumed one of the diets for eight days. Routine examinations of the urine were made daily. The results obtained were that the basic diet not only brought about a physical improvement but also caused a lowering of the nitrogenous substances in the blood and urine, and a reduction of the blood pressure, while the acid diets generally aggravated the nephritis and provoked higher nitrogen values of the blood and urine. From experiments on animals, excessive nitrogenous food has again been shown to cause damage to the kidney. This has recently been demonstrated by Newburgh and Johnston (*J. Clin. Invest.* 10:153 [April 20], 1931). In this investigation, rats were fed a complete diet, to which varying amounts of dried beef liver and also of sodium nucleate were added. Nephritis developed in the animals with 40% of liver, and even 10% of the sodium salt. If 20% of sodium nucleate was added to the food, not only was the parenchyma of the kidney replaced by fibroblastic tissue, but the media of the arterial wall also showed a fibrous thickening. An interesting fact has been determined by Borland and Jackson (*Arch. Pathol.* 11:687 [May], 1931) from an investigation of the effect of fatless food on the structure of rats' kidneys. The diet given the animals consisted of from 12-24% casein, 72-84% of sucrose, 0% fat, and 3.9% salt mixture, and was consumed by the animals for about nine months. At the end of this time the rats were chloroformed. Postmortem examinations revealed calcification in the cells of the renal tubules and in necrotic areas of the medulla. Here, too, large amounts of fatty or albuminous material accumulated and formed casts in the tubules and papillary ducts. The addition of 2-20% of lard or small amounts of cod liver oil

to the diets usually prevented or cured the renal disorder. The concentration of protein in the food did not appear to have an influence on the albuminous degeneration of calcification of the kidneys.

VIII. Goitre, Tuberculosis, and Cancer

A historical review of goitre in Switzerland has been made by Milt (*Schweiz. med. Wchnschr.* 12:280, 1931). Here, an endemic form of the disease was recognized in the sixteenth century, and iodine and surgical measures advised in treatment. Recently, in four provinces of Italy an extensive survey of goitre in school children has been carried out, and the results summarized by Muggia (*Rassegra di studi psichiat.* 20:959, 1931). In the examination of 164,000 pupils a slight enlargement of the thyroid was found in 19.7% of those in the urban and 55.5% of those in the rural districts, while definite goitre was found in 0.7% of the urban, and 9.7% of the rural children. In three of the provinces, the frequency of the disease increased according to the altitude at which the children lived. The general use of iodized salt is recommended as a prophylactic measure. In another survey of the incidence of goitre in Sweden, 22,000 persons were examined in 180 districts and reported by Höjer (*Schweiz. med. Wchnschr.* 12:265 [Mar. 21], 1931). The data showed the incidence of the disease to vary according to the topography of the district. The disease is often found in some parts of India, especially the districts near the Himalaya mountains, according to the observations published by Scott et al. (*Ind. J. Med. Res.* 18:1059, 1930-1931). Here, exophthalmic goitre was found not to occur, but myxedema, cretinism, and congenital deaf-mutism were observed in the same district. In several provinces the percentage of congenital deaf-mutes varied according to the locality to a remarkable degree, and more or less according to the amount of lime found in the water. The highest percentage was found in Northern Burma where there is a great deal of lime in the water and a custom is prevalent among the people of eating large quantities of calcium. The disease has been prevented generally in parts of Switzerland by the use of iodized salt, according to the report of Hämmerli (*Schweiz. med. Wchnschr.* 37:881, 1931), and the more general use of this measure has been advocated.

Stefko (*Schweiz. med. Wchnschr.* 8:171 [Feb. 21], 1931) had an opportunity to make many postmortem examinations of starved children during the famine in Moscow, and has written the results. Changes from malnutrition were found in many of the glands and among them the thyroid showed a parenchymatous degeneration. Abstinence from meat, therefore, has been suggested as a factor in the cause of goitre. McCarrison and Sankaran (*Indian J. Med. Res.* 19:67 [July], 1931) have studied the urinary excretion of iodine in healthy persons and goitrous patients in India, but did not find a difference. A higher percentage of iodine was excreted in the autumn than in the spring, and more by the female than the male patients. The iodine content of women's blood from different diets has been determined by Scheringer (*Deutsch. med. Wchnschr.* 57:883 [May 22], 1931). On a low iodine diet, the blood contained about 8γ per 100 cc.; but a single meal of fish about doubled the circulating iodine. The content also changed during menstruation, and in the last months of pregnancy the iodine increased to 25γ to 100 cc. of blood. Goitre has been produced in rats by Hellwig (*Arch. Pathol.* 11:709 [May], 1931) with a mixed diet and drinking water containing 2% of calcium chloride. When the iodine content of the diet was low, and the same water was given, an epithelial hyperplasia occurred in the thyroid glands of the animals. On the other hand, Höjer (*Svenska Lak.-Sallsk. Handl.* 57, 1, 1931) has been able to produce goitre in rats fed in a goitrous district on foods grown locally; but when they were fed in a goitre-free district on food from one in which the disease was prevalent, an enlargement of the gland did not occur. Fenger et al. (*J. Am. Chem. Soc.* 53:237, 1931) have determined the iodine content of the thyroid of hogs from Texas and North Dakota during a year, and found marked variations. In the fall the content of the glands of the animals from Texas was 0.78%, and that of the animals from North Dakota 0.53%, whereas in the spring the figures were 0.44% and 0.13%, respectively.

The reports published recently of variations of nutrition in the tuberculous deal largely with the Gerson-Sauerbruch-Hermannsdörfer salt-free diet. Opinions differ in regard to its value, for some investigators have found it worthless, while others consider it beneficial. An analysis of the food consumed by 1,185 potentially tuberculous and tuberculous patients has been made by Gordon and Flanders (*Am. Rev. Tuberc.* 23:84 [Jan.], 1931). The amount of food was about 1,400 calories a day, and consisted largely of meat, potatoes, canned vegetables, and bread. The consumption of milk and butter was strikingly small, and as the disease progressed even less of these foods was used. All patients complained of fatigue, anorexia and sleeplessness; and it was impossible to tell whether these symptoms were the result of the disease or of malnutrition. Some of the patients were given cod liver oil concentrate, but it failed to influence the deposition of lime salts in the diseased tissue. On the other hand various respiratory symptoms improved, and therefore this effect of the concentrate suggested that nourishment derived from a natural source (milk) may be of value in the management of

infection and malnutrition. Vitamins B and D were administered to 64 tuberculous patients by Scheurlen (*Munsch. med. Wchnschr.* 78: 1090 [June 26], 1931), but the course of the disease was found to be unaffected.

The abnormal growth of cells, especially the keratinization of epithelium, in deficiently fed animals, suggests an intimate relationship between the occurrence of tumors and malnutrition. A special study, however, on "Spontaneous Tumors in Mice" has been carried out by Hill (*Lancet* 1: 966 [May 2], 1931). The animals were fed differently; one group had barley, oats, wheat, and green vegetables, another ate cooked meat and vegetables, salt and canned fruit, a third consumed white bread, margarine, cakes, and a little milk, and a fourth and fifth had low protein diets similar to that of the Essex farm hand, though one was fried and the other was uncooked. The incidence of the neoplasms was the same in all groups, 31% of the males and 49% of the females developing the disease. There was, however, a significant difference in the incidence according to age. In the animals dying within a year only 2% had developed tumors, those dying within a year and a half 8%, two years 40%, two years and a half 34%, and three years 16%. There was also a significant variation in the sites of the new growths, as 140 developed in the lung, 76 in the mammary gland, 29 in the liver, 23 in the lymph glands, and three in the thyroid gland. Maisin et al. (*C. R. Soc. Biol.* 107: 916 [June 30], 1931) have found that the addition of liver to the diet of mice with tar cancer increased the rate of growth. An interesting piece of work has been reported by Pybus and Fawns (*J. Path. & Bact.* 34: 39 [Jan.], 1931) on "The Effect of Variations in the Media on the Growth of Normal and Malignant Tissues in Vitro." The embryonic and adult heart, and carcinoma M63 of mice were observed in different media. A growth of adult tissue could not be obtained. The serum of pregnant animals, irrespective of whether maternal or not, has a stimulating effect on embryonic heart. An extract of embryonic or testicular tissue more than doubled the growth in 48 hours. A similar effect was produced when mouse carcinoma M63 was grown in these extracts. Heating the media to 55 C. for half an hour had an inhibiting effect on embryonic tissue which was not compensated for by the addition of complement. On the other hand, such a medium favored the growth of carcinoma.

ANIMAL EXPERIMENTATION

There are very definite indications that the Anti-Vivisection Society will make a determined effort to prevent further animal experimentation, especially in the employment of dogs. This matter was very carefully considered by Dr. Walter B. Cannon in an address at the eighty-sixth anniversary of the New York Academy of Medicine recently. He showed the necessity of continuing the employment of animals for study in order to increase the benefits already secured in this way.

The history of medicine is replete with evidences of the great value of experiments which have been used in elucidating the mysteries of disease. It is only necessary to refer to typhoid fever, diphtheria, tuberculosis and bubonic plague as very definite examples of service to mankind which have followed the application of science to the study of disease and the benefits which have been contributed by the lower animals in the solution of these difficult problems.

These remarks by Dr. Cannon have been accentuated by Dr. David J. Kaliski, president of the Medical Society of the County of New York, who recently told more than 750 physicians attending the opening session of the second week's program of the fifth annual graduate fortnight of the New York Academy of Medicine that animal experimentation is absolutely essential for the ultimate solution of the cancer problem and went on to show that cancer cannot be effectively studied or its treatment improved upon by experiments on human beings and that the necessary resource is found in the lower animals. He told in a dramatic way of the progress made step by step in developing the surgical technic of today in very many fields. Much of the surgery of the digestive tract would never have been perfected without repeated trials on animals. It was found necessary during the World War to use dogs in many of the investigations which resulted in the reduction of mortality of the soldiers in service at that time. It must be clearly understood that all who hamper medical research by obstructing animal experimentation must be charged with certain forms of suffering and needless deaths by reason of insufficient knowledge. It should be also fully understood that the medical profession yields to no one group in its merciful regard for the lower forms of animal life but its greater duty to man, woman and child overcomes any sentimental regard for the lower animals.

THE TRAINING OF DOCTORS IN CANCER WORK

Dr. John C. A. Gerster, Chairman of the New York City Cancer Committee, declared November 3 in a radio address that "the high death rate from cancer is due in large part to the fact that many cases are not diagnosed as cancer until the disease has spread through the body. Delayed diagnosis is due to ignorance on the part of the patient and unreasoning fear or inexperience of the doctor". He recommends that special attention should be paid to the education of the family physician in the problems concerned in dealing with cancer.

With the more general understanding of the necessity of appropriate and early treatment, Dr. Gerster believes that the mortality from cancer will be materially reduced.

CASE RECORDS
of the
MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICAL-PATHOLOGIC EXERCISES

EDITED BY RICHARD C. CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASES 18491 AND 18492

BACK PAIN DUE TO A SYMPTOM COMPLEX NOT GENERALLY RECOGNIZED IN THIS COUNTRY

PRESENTATION OF CASE 18491

ORTHOPEDIC DEPARTMENT

DR. W. RICHARD HOCHWALT*: This patient was a woman aged fifty who was admitted to the Baker Memorial in January complaining of pain in the lumbar region of her spine of two months' duration. It was not helped by the usual supportive treatment such as strapping, corset and rest at home in bed.

She was admitted for study. X-ray examination showed extreme osteoporosis of the lumbar vertebrae. The condition was diagnosed as osteomalacia by Dr. Hampton. In view of this, calcium and blood phosphorus determinations were made. It was found that the calcium was 11.3 and the phosphorus 4.25. These findings ruled out any cause of osteomalacia and were consistent with calcium deposition. The patient was then seen by Dr. Albright, who thought that she might possibly have pernicious anemia. The blood picture slightly resembled that of pernicious anemia. The red cells were 2,150,000 and the hemoglobin 55 per cent. The white cell count was 3,450. In view of the findings Dr. Albright advised viosterol and liver extract. The patient was discharged from the Baker Memorial on March 3.

She was followed by Dr. Smith-Petersen's office until she died. She improved somewhat at home until May 23, when Dr. Van Gorder found her in a comatose condition, unable to recognize anyone. The breathing was Cheyne-Stokes. The pulse was quite good. There was nothing that could be done in the way of therapy at that time. She died on May 25.

DR. AUBREY O. HAMPTON: We did not have films of any of this patient's bones except the lumbar vertebrae and the pelvis, both of which were considerably more radiant than normal. The density of the bone was not much greater than the density of the soft tissues. The vertebrae were much narrower than usual and presented a queer deformity. The upper and lower margins of each vertebra were pressed together so that we got an elliptical shape of the vertebral space and a corresponding concave depression in the vertebra.

*Recently resident surgeon on the Orthopedic service.

CLINICAL DISCUSSION

DR. HAMPTON: That appearance was pointed out to us as fishbone vertebrae by Dr. Albright, and he gave us the explanation of it. We used the term osteomalacia in the broadest sense; that is, the bones were soft, we did not know why.

DR. GEORGE W. VAN GORDER: This patient was extremely interesting to us because we could not very well explain her back pain and were not able to make a diagnosis of her condition. She had been a faithful nursemaid in a family for many years and there was no past history of back trouble apparently until she came to Dr. Smith-Petersen's office several months before she entered the hospital. Then her back was exceedingly acute, so that she could not bend in any direction without great pain. We considered her condition one of acute back strain because of her very faulty posture, and thought that rest in bed and hot applications would help. They did help her a little, but not so much as expected. As Dr. Hochwalt suggested, we later applied various forms of supportive treatment as well, but as time went on and we did not succeed in relieving her, it was decided to send her into the Baker Memorial Hospital for study.

The x-ray examination was interesting to all of us because we had not recognized the condition of "fishbone vertebrae" as a possible pathologic lesion before, and the explanation of it was rather difficult to make, it seemed. Dr. Smith-Petersen felt that the primary cause of the vertebral body deformity was swelling of the intervertebral disks, and that this swelling and tension of the disks produced atrophy of the bodies of the vertebrae. This theory was absolutely opposite to the idea expressed by Dr. Albright and the radiologists, who felt that the swelling of the intervertebral disks was secondary and adaptive to the atrophy of the vertebral bodies. Dr. L. B. Morrison's advice was asked. He believed, with Dr. Smith-Petersen, that the disease was primary in the disks and not in the bodies of the vertebrae. The controversy went on for quite a while among us. I personally became so interested to know the truth about the matter that after the patient left the hospital I kept a distant eye on her and managed to get permission for autopsy at the time of her death, in the hope that we might learn the truth as to whether the intervertebral disks were the primary or the secondary factor in the production of "fishbone vertebrae". In this patient's case it seemed that there was localized osteoporosis in only the lumbar region of the spine, because previous x-rays taken by Dr. Morrison did not show the same condition in the dorsal vertebrae,

so we felt that she had a rather strange localized atrophy of her lumbar spine which might be partly due to anemia and partly to osteoporosis, but we never made a diagnosis. Even after the autopsy we were not sure.

DR. FULLER ALBRIGHT: I should like to say a word about fish vertebrae. What we mean by a fish vertebra is a biconcave vertebra instead of a rectangular vertebra. That was described by von Recklinghausen in his monograph describing von Recklinghausen's disease. In any condition where there is softening of the vertebrae that condition is present. He was greatly in favor of the idea that it was due to disease of the vertebrae rather than of the intervertebral disks. We get it in osteomalacia occasionally, in rickets, in any destructive lesion of the bone, and in tumors of the bone. In the middle of the intervertebral disk is a little round body which is squeezed in and acts like a shock absorber in that it constantly tends to expand. When the vertebrae are soft, this body, the remnant of the notochord, expands into a sphere, causing the adjacent vertebrae to be concave.

Another word about osteomalacia. The word is used altogether too frequently. I think the radiologists have made the term synonymous with a lack of calcium in the bone. In England and Germany osteomalacia means disease in which the osteoid tissue in the bones is increased. I think the term ought to be confined to the cases in which there is increased osteoid tissue. There was too little calcium in the bones from the x-ray point of view, but the blood chemistry showed a normal calcium and phosphorus consistent with osteoporosis but not with osteomalacia. The curious thing is that it might be said that the calcium is a little high and the phosphorus is a little high too, if anything. In view of what was found that is not surprising.

DR. J. H. MEANS: Was there anything in the past history giving any hint as to the possible etiology of this osteoporosis?

DR. VAN GORDER: It was suggested that her diet had been rather peculiar, but I do not know if it was found definitely that she had been eliminating meats and other things from her diet. Dr. Albright studied this phase of her condition. It seems to me that no definite diet deficiency was found in this case.

DR. TRACY B. MALLORY: Dr. Hunter made a note that there was a deficiency in meat.

DR. MEANS: I had a patient in the Baker Memorial who had some points of resemblance to this one, one who had had exophthalmic goiter eight years before, cured apparently by operation. She came in this summer having had backache something like this patient's except that it began acutely. While driving her car in the middle of August she had sudden onset of lumbar pain. This continued as a persistent dull backache which supportive treatment had not helped. Dr. Hampton took an x-ray which was like the present one in some respects. The entire skeleton showed marked osteoporosis. As I recall it the appearance in the vertebrae was something like this fishbone vertebrae condition, only not so marked. There was pathologic fracture of the first lumbar vertebra which I presume had taken place when she had the sudden onset of pain. The etiology, Dr. Albright suggested, was perhaps that during the time she had the exophthalmic goiter, which was particularly chronic, the skeleton had been decalcified to a certain degree and her diet subsequently had not been one that would enable her to put calcium back.

DR. MALLORY: Dr. Bock has also had a similar case.

PRESENTATION OF CASE 18492

MEDICAL DEPARTMENT

DR. ARLIE V. BOCK: I saw the patient in the office and sent her directly over to the Baker Memorial. She was a married white woman fifty years of age. There was a history of four years' duration of pain reaching along the lower costal margins. It was excruciating pain, coming without relation to meals, bowel movements or any other particular functions, with great exacerbations on attempting to stand. She could no longer ride in an automobile, movements of the car causing exacerbations of the pain.

Two years later she began to have pain in the lower back and the right hip joint, worse in the morning and always intensified by bending over and by being on her feet for some time. There was very little accentuation on walking, but changes in posture always brought back the pain acutely. No diagnosis had been made by her physicians except muscular rheumatism. She was given various medicines and Alpine lamp treatments with no effect. There was a history of shortening of stature by about three inches since the onset. There was a dietary deficiency in that she had not had much meat, had practically excluded milk from her diet and had eaten almost no fresh fruit. I think that is all there was of significance in the history.

Physical examination showed a person in a very good state of nutrition, with rather accentuated dorsal curvature of the spine, rather a knuckled-over type of person, but otherwise there was very little that was abnormal. The heart showed evidence of enlargement. She had definite gallop rhythm. The blood pressure was normal.

The laboratory findings were not particularly suggestive. The urine was normal. The red blood cell count was 4,570,000, the white cell count 11,400. The differential count showed 89 per cent polynuclears. I thought that was

rather queer. On repeating the count two or three days later the differential count showed the polynuclears to be 57 per cent, the lymphocytes 36 per cent. Two stool examinations were negative. A Hinton test was negative. The nonprotein nitrogen was 30 milligrams, the blood calcium 10.5, the blood phosphorus 2.96.

A Graham test with the dye given by mouth showed no signs of filling of the gall bladder. On repeating the test with the dye given intravenously a normal gall bladder was visualized. A liver function test was normal.

DR. HAMPTON: The heart was enlarged downward and to the left. There was a tortuous aorta. There were normal lung fields. The abdominal aorta showed calcification also.

DR. BOCK: There was also an extraordinarily tortuous thoracic aorta.

DR. HAMPTON: I want to show the similarity of the two spines, that in Case 18491 and the one in this case of Dr. Bock's. Perhaps the first case had more deformity than this case. This case also had calcification in the aorta, not seen in the other case. She had the same changes in all her bones. I think it is easy to mistake decalcified normal shaped vertebrae for fishbone vertebrae if one does not get the radiograph on center. The circular margins of the vertebrae may easily be projected as an elliptical shadow.

DR. MALLORY: It is interesting to note that in this case too the marked changes are limited to the lumbar vertebrae.

DR. HAMPTON: The lumbodorsal spine shows osteoporosis, not so marked in the cervical spine.

The pelvis shows very definite osteoporosis. The density of the soft tissue and that of the bone is almost the same. The trabeculae were very sparse and widely separated, not continuous. There were trabeculated areas in the ileum. She did not have any bowing or any twisting of the pubis such as is described in the English type of osteomalacia.

DR. VAN GORDER: Did the long bones show anything abnormal?

DR. HAMPTON: The long bones were not so abnormal as the flat bones. If one were not looking for decalcification one would probably say they were normal. Two or three were perhaps a little thin.

Dr. Holmes always asks to have a skull film in osteomalacia because he thinks the bones there will not be affected by the atrophy of disuse.

CLINICAL DISCUSSION

DR. BOCK: The patient was put on a high calcium diet and returned six months later. Dr. Hampton thought that the bones were worse then than they were at the first observation. I could not see any definite change.

DR. HAMPTON: Comparisons by x-ray in that respect are not very accurate.

DR. ALBRIGHT: I think the case is interesting because of the results of treatment. She came back and after treatment felt better.

DR. BOCK: There was much less pain. I attributed that to the orthopedic care that she had had. Dr. Smith-Petersen advised exercises for her back. I felt that her relief was due to the exercises rather than to effects produced by dietary changes.

This patient was interesting also because her heart showed gallop rhythm, yet she had no cardiac symptoms.

DR. HAMPTON: This patient had a very interesting Graham reaction, too. The Graham test by the oral method was positive. By the intravenous method it was negative. We wondered if by any stretch of the imagination it could be that she had the same trouble with the Graham dye that she did with the calcium; that is, that she could not absorb it.

CLINICAL DIAGNOSES, CASE 18491 (FROM HOSPITAL RECORD)

Osteoporosis of the vertebrae (with fishbone).
Anemia, primary?
Deficiency disease?
Cerebellar arteriosclerosis.

ANATOMIC DIAGNOSES, CASE 18491

Plasma cell leukemia.
Plasmocytoma, leukemic type, vertebrae and liver.
Osteoporosis of vertebrae.
Fishbone deformity of vertebrae.

DIAGNOSES, CASE 18492

Osteomalacia.
Fishbone deformity of vertebrae.

PATHOLOGIC DISCUSSION

DR. MALLORY: We will go back to the autopsy findings in the first case. Of course the bone condition which had focused interest and attention on the case was obviously only one feature. She could not have died of that. The most significant of the other findings in life was the very marked anemia. The red cell count was 2,000,000, the white cell count 3,450. She had very careful studies to rule out pernicious anemia, and since she had hydrochloric acid it was felt that this could be done. No satisfactory cause for the anemia was discovered even at autopsy on gross examination. We were still in complete doubt as to the cause of her death.

It was not until our sections came through that the condition became obvious. We found that all the vertebral bodies showed extensive infiltration of the marrow spaces with plasma cells, looking very much like a plasma cell myeloma. The type of cell was exactly the

same, but the cells were not growing in solid tumor masses as an ordinary plasma cell myeloma does. There was merely a diffuse infiltration of the entire marrow space, quite analogous to that seen in leukemia except that plasma cells took the place of the myeloid cells one might expect to see. Further sections also showed in the liver sinusoids very large numbers of plasma cells. I think there is no question but that she had plasma cell leukemia. After she left the hospital there was no further blood examination, but I think if studies had been made shortly before her death they would have shown plasma cells in the blood stream.

I have some drawings that will show the findings. This first one from the bone marrow shows 80 per cent of small cells with dense round nuclei with peripheral chromatin which are usually eccentrically placed, pretty typical plasma cells. In between these a few cells of the myelocyte series can be made out, and some immature cells of the red cell series. The predominating cell throughout is the plasma cell. The liver shows foci of plasma cells in the sinusoids. The gross section of the spine as we sawed through it shows ballooning out of the intervertebral disks and very marked biconcave narrowing of the vertebrae, most marked in the lumbar vertebrae but in this instance extending well up into the thoracic portion, corresponding with the ballooning of the disks. It has been pointed out before that these lesions are most characteristic in the lumbar vertebrae, whereas in the thoracic region one gets a wedge-shaped deformity instead of the biconcave one. In some of the intervertebral disks a cystic space is formed. In some instances there is herniation of the cartilage into the vertebral body. Herbert Junghanns* of Schmorl's clinic in Dresden attempts to explain the limitation of this fishbone change in the vertebrae of the lumbar spine by a consideration of the normal curvature of the spine. The lumbar spine normally is lordotic, the dorsal spine kyphotic. In the lumbar spine the weight bearing is probably about the center of the vertebral body. The cartilage, if it has maintained its normal elasticity, will bulge into the softened body. If the cartilage shows degenerative changes and has lost its elastic properties we get a wedge shaped deformity in the lumbar spine such as we ordinarily get in the thoracic spine. In the majority of senile cases we should not get this bulging, and the intervertebral disks would also show marked changes. It is only when the intervertebral disks are relatively normal that we get this type of change. Does that reasoning sound logical to you, Dr. Van Gorder?

DR. VAN GORDER: It is not very impressive to me, because in tuberculosis, where we also find definite involvement of the intervertebral areas, the resulting deformity is one of wedging of the lumbar vertebrae and not concave cupping, as in this disease.

DR. MALLORY: There is more marked and more localized destruction in tuberculosis than there is here. Here there is merely a generalized softening.

DR. BOCK: Is there such a thing as disease of the disks?

DR. VAN GORDER: Where the disk forms a little cavity in the vertebral body it is called an inclusion of the intervertebral disk, which may or may not be considered a pathologic process in the disk itself. There has been considerable written recently about the intervertebral disks. In some instances we know that the projections of the disk may extend posteriorly into the spinal canal and cause pressure on the cord; in other instances portions of the disk have extended upward or downward into the adjacent vertebral body, forming a cyst. All of these conditions arise from the intervertebral disk itself.

DR. MALLORY: In a number of these cases Junghanns has reported herniation of the disk into the vertebrae. He believes that they are due to primary softening of the vertebrae simply from pressure. The disk substance is forced up into the vertebrae.

DR. VAN GORDER: In my reading on this subject I gathered the impression that the disks themselves can be pathological.

DR. MALLORY: Once one recognizes a thing of this sort and starts looking for it the cases immediately seem to become more common. We have another case with somewhat similar spinal changes. Biopsy in that case had shown typical rapidly growing lymphosarcoma. I think there is no question as to the diagnosis. I believe it is also true that the patient had a considerable amount of symptomatic relief of this back pain from x-ray treatment even though there was not much change in the actual appearance of the bones.

DR. HAMPTON: I notice that her dorsal vertebrae do not present the typical shape we saw in the lumbar vertebrae. I wonder if this is the same type of lesion. We found this after she died and we thought the deformity became worse. We treated her vertebrae all up and down the dorsal region. We thought that if this softening was due to lymphoma we could establish lymphoma from the destroyed bone. All the bones showed the same thing those in the other case had shown.

She had an annular constricting lesion in the ascending colon and another similar lesion in the descending colon. From the barium enema before and after treatment I could not say that there was any change in the palpable tumor.

DR. HOLMES: We feel quite strongly that the disease is primary in the vertebrae and that

*Herbert Junghanns, Arch. f. Klin. Chir. 165, II: 303.

rather queer. On repeating the count two or three days later the differential count showed the polynuclears to be 57 per cent, the lymphocytes 36 per cent. Two stool examinations were negative. A Hinton test was negative. The nonprotein nitrogen was 30 milligrams, the blood calcium 10.5, the blood phosphorus 2.96.

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Fishbone deformity of vertebrae.

PATHOLOGIC DISCUSSION

DR. MALLORY: We will go back to the autopsy findings in the first case. Of course the bone condition which had focused interest and attention on the case was obviously only one feature. She could not have died of that. The most significant of the other findings in life was the very marked anemia. The red cell count was 2,000,000, the white cell count 3,450. She had very careful studies to rule out pernicious anemia, and since she had hydrochloric acid it was felt that this could be done. No satisfactory cause for the anemia was discovered even at autopsy on gross examination. We were still in complete doubt as to the cause of her death.

It was not until our sections came through that the condition became obvious. We found that all the vertebral bodies showed extensive infiltration of the marrow spaces with plasma cells, looking very much like a plasma cell myeloma. The type of cell was exactly the

same, but the cells were not growing in solid tumor masses as an ordinary plasma cell myeloma does. There was merely a diffuse infiltration of the entire marrow space, quite analogous to that seen in leukemia except that plasma cells took the place of the myeloid cells one might expect to see. Further sections also showed in the liver sinusoids very large numbers of plasma cells. I think there is no question but that she had plasma cell leukemia. After she left the hospital there was no further blood examination, but I think if studies had been made shortly before her death they would have shown plasma cells in the blood stream.

I have some drawings that will show the findings. This first one from the bone marrow shows 80 per cent of small cells with dense round nuclei with peripheral chromatin which are usually eccentrically placed, pretty typical plasma cells. In between these a few cells of the myelocyte series can be made out, and some immature cells of the red cell series. The predominating cell throughout is the plasma cell. The liver shows foci of plasma cells in the sinusoids. The gross section of the spine as we sawed through it shows ballooning out of the intervertebral disks and very marked biconcave narrowing of the vertebrae, most marked in the lumbar vertebrae but in this instance extending well up into the thoracic portion, corresponding with the ballooning of the disks. It has been pointed out before that these lesions are most characteristic in the lumbar vertebrae, whereas in the thoracic region one gets a wedge-shaped deformity instead of the biconcave one. In some of the intervertebral disks a cystic space is formed. In some instances there is herniation of the cartilage into the vertebral body. Herbert Junghanns* of Schmorl's clinic in Dresden attempts to explain the limitation of this fishbone change in the vertebrae of the lumbar spine by a consideration of the normal curvature of the spine. The lumbar spine normally is lordotic, the dorsal spine kyphotic. In the lumbar spine the weight bearing is probably about the center of the vertebral body. The cartilage, if it has maintained its normal elasticity, will bulge into the softened body. If the cartilage shows degenerative changes and has lost its elastic properties we get a wedge shaped deformity in the lumbar spine such as we ordinarily get in the thoracic spine. In the majority of senile cases we should not get this bulging, and the intervertebral disks would also show marked changes. It is only when the intervertebral disks are relatively normal that we get this type of change. Does that reasoning sound logical to you, Dr. Van Gorder?

DR. VAN GORDER: It is not very impressive to me, because in tuberculosis, where we also find definite involvement of the intervertebral areas, the resulting deformity is one of wedging of the lumbar vertebrae and not concave cupping, as in this disease.

DR. MALLORY: There is more marked and more localized destruction in tuberculosis than there is here. Here there is merely a generalized softening.

DR. BOCK: Is there such a thing as disease of the disks?

DR. VAN GORDER: Where the disk forms a little cavity in the vertebral body it is called an inclusion of the intervertebral disk, which may or may not be considered a pathologic process in the disk itself. There has been considerable written recently about the intervertebral disks. In some instances we know that the projections of the disk may extend posteriorly into the spinal canal and cause pressure on the cord; in other instances portions of the disk have extended upward or downward into the adjacent vertebral body, forming a cyst. All of these conditions arise from the intervertebral disk itself.

DR. MALLORY: In a number of these cases Junghanns has reported herniation of the disk into the vertebrae. He believes that they are due to primary softening of the vertebrae simply from pressure. The disk substance is forced up into the vertebrae.

DR. VAN GORDER: In my reading on this subject I gathered the impression that the disks themselves can be pathological.

DR. MALLORY: Once one recognizes a thing of this sort and starts looking for it the cases immediately seem to become more common. We have another case with somewhat similar spinal changes. Biopsy in that case had shown typical rapidly growing lymphosarcoma. I think there is no question as to the diagnosis. I believe it is also true that the patient had a considerable amount of symptomatic relief of this back pain from x-ray treatment even though there was not much change in the actual appearance of the bones.

DR. HAMPTON: I notice that her dorsal vertebrae do not present the typical shape we saw in the lumbar vertebrae. I wonder if this is the same type of lesion. We found this after she died and we thought the deformity became worse. We treated her vertebrae all up and down the dorsal region. We thought that if this softening was due to lymphoma we could establish lymphoma from the destroyed bone. All the bones showed the same thing those in the other case had shown.

She had an annular constricting lesion in the ascending colon and another similar lesion in the descending colon. From the barium enema before and after treatment I could not say that there was any change in the palpable tumor.

DR. HOLMES: We feel quite strongly that the disease is primary in the vertebrae and that

*Herbert Junghanns, Arch. f. Klin. Chir. 165, II: 303.

the natural spring of the nucleus pulposus tends to cause the deformity. The disease is entirely in the vertebrae. I do not quite understand why the appearance in the lumbar region should differ from that in the dorsal region. Your explanation is interesting, but I am not quite convinced.

Dr. Hampton brought up a question in regard to the failure of the dye to be absorbed from the intestinal tract and whether failure to absorb calcium might not be brought about in the same way. In this case which had intestinal obstruction could the obstruction have caused the bone changes?

DR. ALBRIGHT: This question whether the cause of calcium deficiency might be the same factor that might possibly influence absorption of the Graham dye is merely an interesting question. I do not think one could foretell anything.

DR. MALLORY: The first case is also worth a few words on the question of the relationship of myeloma to plasma cell leukemia. I am more and more impressed with the fact that the cases of myeloma being reported seem to be giving progressive evidence that it is not primarily a tumor of the bone. Jackson, Parker and Bethea* have reported from the City Hospital several cases of extra-osseous plasmocytoma. One of those patients died eight years later with typical myeloma involving most of the bones. Probably plasma cell leukemia represents simply the more diffuse form of the same tumor. In this case it is one in which circulatory metastases are occurring.

*Jackson, Henry, Jr., Parker, Frederick, Jr., and Bethea, James M. Plasmacytomata and their relation to multiple myelomata. Am. J. Med. Sci. 181:169, 1931.

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THE REPORT OF THE COMMITTEE ON THE COSTS OF MEDICAL CARE

LAST week a digest of the final report of the Committee on the Costs of Medical Care appeared on pages 996-1001 of this *Journal*. The *Journal of the American Medical Association* also gave space to a consideration of the same report. Emphasis on the distinctive features of the Committee's document apparently represents to some extent the interpretation of the subject matter by the writers of these two summaries.

In the *Journal of the American Medical Association* there was also published an editorial discussion of the report in which it was stated that the recommendations of the Committee would not come as a surprise to thousands of physicians, etc., in answer to which we may properly declare that the criticisms of the majority report by the *Journal of the American Medical Association* come as no surprise to the members of the Committee. Dissenting opinions have been expected for many months and have been welcomed, since it was shown that there is a cleavage in the minds of people interested in the economic problems of medical care with respect to the value of experiments now being made and possibilities of benefit in recommendations for certain innovations. There is abundant evidence that the economics of medical practice are in an unsatisfactory state and that constructive intelligence coupled with imagination must plan and experiment in this field of service, if better conditions are to prevail. It is silly to sit inactive on the sidelines when changes in the habits of a great nation are taking place.

The Committee may well feel satisfied with the work which has been carried on and especially pleased with the many expressions of approval of its recommendations. A very significant feature of the minority report is that, in its dissenting opinions, modifying statements are given to the effect that there are possibilities of unobjectionable forms of group and contract practice and also that there is no opposition to the principle of insurance in dealing with the costs of illness, but only to those forms which are destructive of ethical medical practices.

The critical and antagonistic spirit of the editorial in the *Journal of the American Medical Association* need not mislead timid doctors, for there is no real reason to believe that the foundations of the general practice of medicine and the close and intimate relations of the family doctor are to be torn asunder. The recommendations of the majority will supplement the work of the individual physician and provide for service not now available, or indifferently supplied, in many instances.

There is sufficient evidence of support of the majority report by far-sighted physicians, so that there will not be any general reaction to catchword phrases designed to stampede the profession.

The reports are now before the medical profession, sociologists and the people. In the last analysis, the people will decide many of these questions and a responsibility rests upon students of the problems to have recommendations passed upon by an intelligent jury.

MEDICAL EDUCATION AND MEDICAL PRACTICE

THE purpose of medical education is to prepare for medical practice and it is well to raise the question from time to time as to how adequately this function is performed.

There is no compendious test of success in medical education or in medical practice that can be applied satisfactorily to such a multitude of candidates as exists in the United States, yet one can find many occasions when the physician

has not met the demands upon him. But as a part of fallible humanity, how blameworthy is he, if with reasonable care and skill, his utmost efforts fail to save the life or even preserve the health of the patient? Any test of knowledge and skill must be reasonable for the time and circumstances. If there has been marked progress in the past fifty years, a fair test of qualification today would have been unreasonable in 1882. So, too, in an unprogressive community, one would not expect the standards of medical education and practice that one finds in an enlightened commonwealth. What does one find? One finds in Massachusetts the lowest standards of qualification for medical practice in the United States.

There has been a strong drift toward standardization in medical education in the past twenty-five years, with some of the harmful effects of unintelligent standardization. These have been suffered and now partly removed, and there is a growing recognition that such requirements as are set up should be minimum reasonable standards. Although some uniformity of minimum standards has been established, there is no power of enforcement of such standards, in spite of implications to the contrary concerning the alleged "medical trust". The only power the American Medical Association has is to say to a school in substance if you do not meet our standards, we will not recognize you as a medical school. This is cutting an acquaintance on the street. The only power the Association of American Medical Colleges has is to say if you do not meet our standards you cannot belong to our association; an exclusive club. The only power any state board can have is to say "if you do not meet with our approval, your graduates will not be eligible to take our examination".

What kind of education is given in these unrecognized or unapproved schools? If one judges by the results of the examinations before the Massachusetts Board of Registration in the year 1931, it is not of the best. To be sure the examinational test is not very satisfactory to determine qualifications for practice. The annual report of the Board shows that of 210 graduates of Class A schools, 4 per cent were rejected. Of 41 graduates of eclectic schools 61 per cent were rejected. Of 53 graduates of osteopathic schools 69 per cent were rejected. Of 31 graduates of "unclassified schools" 81 per cent were rejected.

There are suggested two further lines of enquiry which it would be well to follow. In the first place, how do these unclassified schools compare with the "better class of medical schools in the United States?" (The actual standard in Texas.) And further what actually are the teachers, the courses of study, the equipment, the students in these schools?

NUTS!

A RECENT monograph containing excellent material, and evidently the result of an enormous amount of hard work, has in it over three hundred brief case histories. The pleasure and ease of studying the article is very much reduced by the fact that every single mass or lesion described whether from clinical examination or changes on the roentgen ray film, is described in terms of vegetables, fruits or nuts. Unfortunately, some of the individual terms used are of variable size and shape, such as beans, and others are of local meaning in the home of the author, but of no meaning in other places, such as Barcelona nuts.

Once a house officer described in a record a tumor as the size of a Mexican walnut. When asked what size that meant he replied that he did not know, that he had never seen the tumor, did not know how big it was, and that it was a * * * of an imposition that he had to write up that history anyway.

THIS WEEK'S ISSUE

CONTAINS articles by the following named authors:

GAETAN, LIBERTAD R. S.B., M.D. Harvard University Medical School 1932. Address: Hospital General de Madrid, Madrid. Associated with him is

EMERY, EDWARD S. JR. A.B., M.D. Harvard University Medical School 1920. Associate in Medicine, Peter Bent Brigham Hospital. Instructor in Medicine, Harvard Medical School. Address: 319 Longwood Avenue, Boston. Their subject is "Carcinoma of the Esophagus: An Analysis of Sixty-one Cases." Page 1013.

MCCLURE, CHARLES W. M.D. Ohio State University College of Medicine, Columbus, 1910. Member Senior Staff Evans Memorial. Chief of Gastrointestinal Division of Department of Biochemical Research, Evans Memorial. Gastroenterologist to the Out-Patient Department, Massachusetts Memorial Hospitals. Physician to the Massachusetts Memorial Hospitals. Assistant Professor of Medicine, Boston University School of Medicine. Address: 416 Marlborough Street, Boston. Associated with him are

HUNTSINGER, MILDRED E. M.A. Chemist to the Department of Biochemical Research, Evans Memorial, Massachusetts Memorial Hospitals. Address: 62 Queensberry Street, Boston. And

FERNALD, ALISON T. B.S. Technical Chemist, Evans Memorial. Address: Evans Memorial, Boston. Their subject is "Studies in Fat Metabolism. V. Observations on the Lipids and the Phosphorus Compounds of Human Bile." Page 1015.

MCCARTHY, FRANCIS P. M.D. Tufts College Medical School 1905. Pathologist, St. Eliza-

beth's Hospital and Quincy City Hospital. Instructor in Dermatology, Tufts College Medical School. Professor of Oral Medicine, Tufts College Dental School. Assistant Visiting Physician, Department of Dermatology and Syphilology, Boston City Hospital. Address: 371 Commonwealth Avenue, Boston. Associated with him is

WILSON, ROBERT JR. A.B., M.D. Medical College of the State of South Carolina 1930. Senior House Officer, Fourth Medical Service, Boston City Hospital. Address: Boston City Hospital, Boston. Their subject is "Paroxysmal Hemoglobinuria." Page 1019.

KIRKLIN, BYRL RAYMOND. B.S., M.D. Indiana University School of Medicine 1914. Assistant Professor of Radiology, Mayo Foundation and University of Minnesota, Graduate School of Medicine. Chief of Section on Roentgenology, Mayo Clinic. His subject is "Roentgen Rays in the Diagnosis of Early Pulmonary Tuberculosis." Page 1023. Address: 1104 7th Street, S. W., Rochester, Minnesota.

CARY, EDWARD H. LL.D., M.D. University and Bellevue Hospital Medical College 1898. F.A.C.S. President of the American Medical Association. Professor of Ophthalmology, and Oto-Laryngology, Baylor University College of Medicine. Emeritus Dean and Chairman of the Department, Diseases of Eye, Ear, Nose and Throat, Baylor University College of Medicine. Surgeon of the Missouri, Kansas and Texas Railway, Southern Pacific Lines, Cotton Belt Route. His subject is "Glaucoma." Page 1032. Address: 1719 Pacific Avenue, Dallas, Texas.

BURNETT, FRANCIS L. S.B., M.D. Harvard University Medical School 1906. Assistant in the Dermatological Department at the Massachusetts General Hospital. Graduate Assistant in Medical Department at Peter Bent Brigham Hospital. His subject is "The Progress of Nutrition." Page 1040. Address: 205 Beacon Street, Boston.

WILLIAM LAMBERT RICHARDSON, M.D.

THE death of Dr. William L. Richardson has removed from our professional life a distinguished figure, active until quite recently, belonging to a much older medical generation than our own,—a generation which included among others such names as Buckingham, the elder Cheever and Fitz, Gay, the two Shattucks, Walcott, Warren and Wyman. At the time of his death Dr. Richardson was second in academic seniority among the Emeritus Professors of Harvard University, a position to which Dr. Post now succeeds.

William Lambert Richardson was born on September 6, 1842, at the home of his parents on the corner of Pearl and High Streets in Boston. His father, Jeffrey Richardson, was a prosperous merchant and his mother, who before her marriage was Julia Lambert Brackett, belonged to a well-known Boston family. Their home at that time was in the residential district which then extended near to the commercial regions of the waterfront. After his early schooling, young Richardson entered Harvard College in 1860, graduating with the degree of A.B. in 1864. He was elected Secretary of his class and served in this office for sixty-eight years. From College he passed directly to the Harvard Medical School from which he graduated with the degrees of A.M. and M.D. in 1867. Immediately thereafter he went abroad to complete his medical studies which he pursued in Vienna and at the Rotunda Hospital in Dublin, bringing back from these two cities the latest of progress in German and Irish obstetrics.

Beginning the practice of Medicine in Boston in 1868, Dr. Richardson was at first appointed to the Staffs of the Massachusetts General Hospital, the Children's Hospital, and the Boston Dispensary. Among his coevals he was one of the first to specialize in Obstetrics, and in 1873 he resuscitated the old Boston Lying-In Hospital, then located in a single brick building on McLean Street. In 1875 he became Secretary of the State Board of Health and served in this capacity for several years. In 1871 he was appointed Instructor in Obstetrics at the Harvard Medical School, became Assistant Professor in 1882, and Professor of Obstetrics in 1886.

Among Dr. Richardson's manifold activities, it was his association with the Boston Lying-In Hospital which constituted his outstanding lifework and it is with this institution that his memory is chiefly identified. He worked unceasingly at the Hospital and for its interests. The building on McLean Street was progressively enlarged and remodeled under his fostering care. In 1888 its Training School for Nurses was established. Finally in 1922 the Hospital was removed to its new building on Longwood Avenue, opposite the Harvard Medical School, and at this time, after fifty years of service, Dr. Richardson became President Emeritus of its Board of Overseers. During this half century of his active connection with the Hospital, 75,000 patients were delivered under its care and 291 physicians obtained their training as its Obstetric House Officers. It was Dr. Richardson's ambition to make this Institution not only a place of service to the community but one of the great Obstetric Hospitals of the world, and in this he succeeded as he did in virtually everything he undertook. As a result of his devotion and that of his associates, the Boston Lying-In Hospital ranks to-

day with such Institutions as the Dublin Rotunda, Queen Charlotte's Hospital in London, and the Sloane Maternity of New York.

Throughout his long connection with the Lying-In Hospital, Dr. Richardson carried on the teaching of Obstetrics in its wards and in the Harvard Medical School. In addition to his professional duties, he served as Dean of the Medical School from 1893-1907, and as Dean of the Faculty of Medicine from 1899-1907. Upon his retirement from active teaching in the latter year, he was made Professor of Obstetrics Emeritus. From 1909-1915 he served on the Board of Overseers of Harvard College and in 1926 received the honorary degree of S.D. from this University.

As one of the collateral activities of his life, Dr. Richardson was extremely interested in military affairs and for thirty-five years, from 1870 to 1905, served as Surgeon of the First Corps of Cadets, Massachusetts Volunteer Militia. He was a member of many medical and scientific societies including the American Academy of Arts and Sciences, the American Gynecological Society, the American Public Health Association, the Massachusetts Medical Society, and the Massachusetts Medical Benevolent Society. For thirty years Dr. Richardson was Treasurer of the Benevolent Society and it was chiefly due to his sagacious administration of its funds that the Society has been able to render its extensive assistance to destitute physicians and their dependents.

On July 24, 1867, Dr. Richardson was married in Portland, Maine, to Miss Olivia L. Aitchison Pillsbury who died in 1887. There were no surviving children and for the remainder of his life Dr. Richardson's existence was solitary, save for the many contacts of his professional and public activities.

To all of us who knew him, Dr. Richardson's intense, vigorous, and unusual personality is so familiar that it needs no description. Swift and accurate in observation and judgment, his sagacity was unerring. A man of few and abrupt words, he seemed to some brusque and austere; but those who knew him came to appreciate the warm current of underlying kindlinesses which ran through his whole life. The majority of his acts of helpfulness and benefaction to others are unrecorded, but were none the less genuine and sincere.

After a lifetime thus filled with constructive activity and service, Dr. Richardson withdrew at the close to the seclusion of his home and the companionship of a few old and intimate friends; and thus with relatively little physical disability at the end he died quite suddenly and without suffering on October 20, 1932, in the ninety-first year of his age. At his funeral services held on October 24 at the Arlington Street Church, of which he was a lifelong member, the Rev. Samuel A. Eliot said of him:

"Here was incarnated the common sense, the public spirit, the humorous way of looking at things, the clear integrity, the practical idealism of our New England heritage. By that compulsion of nature which is a call of God he undertook the laborious career of a physician and found deep satisfactions in the ministry of healing. His energies ever widened with increasing responsibilities and he became not only the beloved and trusted doctor, but also the wise and efficient administrator of great trusts, the guide and pioneer of medical education, the founder of institutions for the comfort of those in distress of body and in peril of pain and death. He walked worthy of the vocation to which he had been called, caring for the sick in their necessity, speaking the truth in sincerity and goodwill, ingeniously directing research and crowning his wisdom with the essential grace of common sense.

"Humanity meant to him more than its differences, and his influence and intercourse with all sorts and conditions of men levelled up and raised the grade of all of us who came in contact with him. He fought disease, relieved pain, turned anxiety into joy. We caught the contagion of his pluck and patience. He rang true in every relation of life. He was upright and downright, sane and sure. It was a life abundant in friendship but dependent neither on praise nor blame. To accept the day's duties and pleasures with resolute goodwill and an abundant delight in every opportunity of service—that was his privilege and part. The confidence and affection of a grateful community attended him in life and death."

In another context, Mr. William D. Sohier, one of Dr. Richardson's lifelong associates and friends wrote similarly:

"Invariably cheerful, hopeful, courageous, he radiated hope and comfort in every ward or sick room he entered, inspired the nurses and the family. The patient, too, felt greatly encouraged by his visit, his manner and cheerful voice. He made the best possible of the gravest situations. He breathed hope, never said die, never gave up till the heart ceased to beat.

"To us who knew him, served with him and under him, the greatest achievement of his life was the sense of duty, the value of high courage and aspirations, the never-give-up attitude that radiated from his virile, electrical, magnetic personality."

From appreciations such as these, from our own recollections of him, from the many excellent things which he did, Dr. Richardson's personality and memory will long outlive us all in the community which he so abundantly served.

MISCELLANY

AN HONOR TO DR. WILLIAM P. GRAVES

Dr. William P. Graves of Boston has recently taken passage for England where he will receive an honorary fellowship from the British College of Obstetricians and Gynecologists. This is the third award of this medal and Dr. Graves is the first American to be thus honored.

GEORGE F. BAKER CLINIC

At the present time plans are going forward for the erection of a new addition to the New England Deaconess Hospital unit. The building will be known as the George F. Baker Clinic, and has been made possible through the gift of $250,000 by the late George F. Baker of New York City. This sum was given to be used under the direction of Dr. Elliott P. Joslin, for the specific purpose of studying and treating diabetes and other chronic diseases. The building, which will contain five stories, will be of red brick with limestone base and trim, and will face the Deaconess on the Riverway. It will contain the most modern of hospital equipment, and the rooms will be so constructed that the patient occupancy can be doubled if necessary.

The erection of this building enables the Deaconess Hospital to carry on its present extensive work on an unlimited scale, for it will be equipped with a large class or demonstration room to be used for clinics as well as for teaching nurses and patients in the treatment of diabetes.

One of the features of the building is that the one and two patient rooms are to be arranged so that they may be used for private or semi-private rooms, in order that the patient and some member of the family may live in the hospital and thereby receive instruction in the care of the patient and the preparation of food. Another feature will be two four-bed children's wards, one for boys and one for girls, suffering with chronic diseases. These wards will be segregated from the remainder of the floor and will connect directly by stairway to a pent-house on the roof in which will be located a gymnasium.

It is interesting to note that the Trustees of the New England Deaconess Hospital have safeguarded their institution by insisting that in addition to the funds to complete the building, a guarantee fund be provided to care for the annual operating deficit.

These arrangements mean that the hospital has been given a new building fully paid for which can be used for any type of patient and an annual guarantee for twenty years, equivalent to an endowment of at least $300,000. Furthermore, certain other funds, which have not previously been at the disposal of the hospital, are now released for free beds in the new building. The hospital management anticipates that the Baker Clinic, when in operation, will add in a very material way not only to the capital assets, but also the earning power of the hospital.

CORRESPONDENCE

A TRIBUTE TO DR. THOMAS J. O'BRIEN

November 22, 1932.

Managing Editor,

The *New England Journal of Medicine*,

I think the felicitations on the victory over the Chiropractic Petition on November 8 are not complete without special mention of one who did yeoman service in the fight. I refer to Dr. Thomas J. O'Brien, Executive Assistant to the President of the Massachusetts Medical Society.

As Secretary of the Citizens Committee to Oppose the Chiropractic Referendum, it was my good fortune to be thrown into frequent contact with Dr. O'Brien throughout the contest. I feel that I ought to bear witness to his unremitting labors during the campaign.

I was fortunate enough to hear him speak before the Massachusetts League of Women Voters on which occasion he was opposed by Attorney Conway, speaking for the Chiropractors' Association. Dr. O'Brien's argument was a masterpiece. It was not only vigorous and thorough, but it was so eminently fair that it evoked a spontaneous tribute from his opponent. It was also apparent that the large audience attending the conference was deeply impressed by the address of Dr. O'Brien.

Dr. Dwight O'Hara in his recent letter to you on this subject has very aptly pointed out that the campaign waged against the Chiropractors' Petition was altogether dignified. I join with him in hoping that Dr. Thomas J. O'Brien may be permitted to carry on for many years as a champion of the high standards of admission to medical practice in Massachusetts.

Sincerely yours,
FRANK KIERNAN.

RECENT DEATHS

McKEE—DR. GEORGE MCKEE, aged 81, died at his home in Brighton, November 30, 1932. He graduated in Medicine from the College of Physicians and Surgeons of Boston in 1909 and joined the Massachusetts Medical Society in 1921.

Early in life he was a pharmacist in Brighton, taking up medical practice about fifteen years ago. He was a member of several medical societies. In addition to his interest in medicine and pharmacy he was prominent in several fraternal organizations including Masons, Odd Fellows, Knights of Pythias and Elks.

He is survived by his widow née Mary Widdicombe of London, England, three daughters and three sons.

DRUMMEY — DR. JOSEPH LEONARD DRUMMEY died in Watertown, November 28, 1932, aged 47. He was born in Waltham and began practice in Watertown in 1912, and had served as school physician for sev-

eral years. His widow, Mrs. Irene Drummey, and three children survive him.

JOHNSON — Dr. Warren Lincoln Johnson died November 27, 1932, at the Faulkner Hospital, Jamaica Plain. Dr. Johnson was born in Boston, the son of Patrick J. and Mary A. Johnson and, after graduating from Harvard University, entered the Harvard Medical School graduating with the class of 1924. He served an interneship at the Fifth Avenue Hospital later acting as Assistant Director. He returned to Boston and assumed the duties of zone surgeon of the Maryland Casualty Company.

He joined the Massachusetts Medical Society in 1925 and held membership in the American Medical Association and the Massachusetts Society of Examining Physicians. He leaves a widow, the former Margaret Hughson, a daughter, two brothers and a sister.

SHEA — John F. Shea, M.D., died in Jamaica Plain, November 25, 1932. He graduated from the New York University Medical College in 1898 and had practiced in Jamaica Plain for many years.

RAND—John William Rand, M.D., died in Amesbury, Massachusetts, where he had practiced for forty-seven years, December 4, 1932. He was born in Amesbury, the son of William H. and Mary (Long) Rand, where he acquired his early education. He received his M.D. degree from the University of Michigan Medical School in 1885, and joined the Massachusetts Medical Society in 1892. He retired in 1919. He was a member of the Essex District Medical Society.

Dr. Rand is survived by his widow Ella (Robins) Rand, a daughter, Mrs. Mabel R. Hall, three granddaughters and three great-granddaughters.

BROUGHTON — Arthur Nicholson Broughton, M.D., died December 3, 1932. He was born in Jamaica Plain the son of Nicholson and Aravesta (White) Broughton. His premedical education was in the Roxbury and Boston Latin Schools and Harvard College. He graduated with a cum laude from the Harvard Medical School in 1897 and, after serving an interneship on the Surgical Service of the Massachusetts General Hospital, entered general practice. His success in surgery soon led to major interest in this field. His standing in the profession led to his appointment among ten members of the original staff of the Faulkner Hospital at the time of the establishment of this institution in 1903.

Dr. Broughton joined the Massachusetts Medical Society in 1899 and had served on several important committees. He held membership in the American Medical Association and the American College of Surgeons.

In 1898 Dr. Broughton married Miss Lillian De Wolfe Pingree. He is survived by his widow and one daughter.

OBITUARY

MEMORIAL TO DR. THEODORE A. HOCH

Adopted by the Members of the Massachusetts Psychiatric Society

Dr. Theodore A. Hoch, Superintendent of the Northampton State Hospital, and a member of this society died suddenly in August, 1932.

Dr. Hoch was born at Niles, Michigan, on October 9, 1878. He was graduated from the medical department of the University of Michigan in 1900. After graduation he joined the staff of the Worcester State Hospital, serving as assistant physician, pathologist, and assistant superintendent from 1900 to 1912. From 1912 to 1925 he served on the staff of the McLean Hospital at Waverley. In January, 1926, he was appointed Assistant Commissioner of the Department of Mental Diseases, which position he held until appointed superintendent of the Northampton State Hospital. He assumed the duties of this position on February 1, 1930.

Dr. Hoch was a member of the following societies: Massachusetts Medical Society, American Psychiatric Association, Massachusetts Psychiatric Society, Boston Society of Psychiatry and Neurology, New England Psychiatric Society, and the Northampton Rotary Club. He was also Assistant Professor of Psychiatry at the Tufts College Medical School.

He was married in 1906 to Lenora McNiven, who, with one daughter, Janet, survives him. In his death, Psychiatry has lost a keen observer and a splendid counselor. His place in the community will be hard to fill and his place in the hearts of those who knew him will never be filled.

NOTICES

CLINICS IN MEDICINE AT PETER BENT BRIGHAM HOSPITAL

On Thursdays at 3:30 P. M. in the Amphitheatre of the Peter Bent Brigham Hospital Dr. Henry A. Christian, Hersey Professor of the Theory and Practice of Physic, Harvard, and Physician-in-Chief, Peter Bent Brigham Hospital, will give a series of clinics which members of the medical profession are cordially invited to attend. The next clinic will be given on December 15.

Physicians and medical students are also invited to attend ward rounds of the Medical Staff of the Peter Bent Brigham Hospital held from 10-12 o'clock on Saturdays, as well as a clinical-pathological demonstration immediately following these rounds.

AN OPENING FOR A PHYSICIAN

Word has come of an excellent opening for a doctor in Weston, Vermont, with a contributing territory of four other towns.

Information respecting the situation in Weston may be acquired from Rev. C. P. Hanson of that town.

REMOVALS

RALPH H. WELLS, M.D., announces the removal of his office to his home at 1430 Massachusetts Avenue, Lexington, Mass.

CLARA L. THOMPSON, M.D., announces the removal of her office to The Riviera, 270 Huntington Avenue, Boston.

RADIO HEALTH MESSAGES

DECEMBER, 1932

Sponsored by the Public Education Committee of the Massachusetts Medical Society and the Massachusetts Department of Public Health.

Courtesy WBZ. Tuesdays, 4:15 P. M.

December

13 How Are You?
20 Chorea or St. Vitus' Dance
27 Hemorrhoids

STATE HOUSE BROADCAST

Sponsored by the Massachusetts Department of Public Health.

Courtesy WEEI. Fridays, 12:30 P. M.

Health Subjects of Public Interest discussed by the Division Directors of the Department.

RADIO HEALTH FORUM

Queries from the public are answered under the sponsorship of the Department of Public Health.

Courtesy WEEI. Fridays, 4:50 P. M.

Questions on Health and Prevention of Disease may be sent to Radio Health Forum, State Department of Public Health, State House, Boston.

REPORTS AND NOTICES OF MEETINGS

WILLIAM HARVEY SOCIETY

The William Harvey Society met on Friday evening, November 4, 1932, in the Beth Israel Hospital Amphitheatre. An address was delivered by Dr. Hubert Ashley Royster of Raleigh, North Carolina, ex-chairman of the Surgical Section of the American Medical Association. The speaker was introduced by Dr. Horace Binney.

Dr. Royster chose as his subject, "The Tragedy of Appendicitis." The appendix was a product of the sixteenth century anatomically, the seventeenth and eighteenth centuries pathologically, and the nineteenth century clinically. It is modern only because its existence and importance have been overlooked until comparatively recently. The first recorded case of perforated appendix was in 1759. Bright and Addison described the symptomatology somewhat later, and in 1867 Willard Parker obtained three cures after drainage of abscesses secondary to perforated appendices. To Reginald H. Fitz of Boston is due the main credit, for in 1886 he described the condition fully. coined the word "appendicitis", and advised early operation as the only cure for the disease.

The appendix has been found in the retrocecal position in sixty-nine per cent of the cases, in the pelvic position in twenty-seven per cent, and subcecally in only one per cent. Little is known of the physiology of this organ, but it was formerly thought to secrete fluid. Some have termed it the "abdominal tonsil", for it does contain considerable lymphoid tissue, and can sometimes be demonstrated to be one of the notorious so-called foci of infection.

In some reflections on the pathology of the condition, the lecturer spoke of the stages of the disease. The mucous membrane is first affected and then the penetration to the outer wall follows. If the infection does not penetrate the wall, or until it does, it is not immediately dangerous to life. The wall yields in (1) perforation, and (2) gangrene, due to plugging of the ileocolic or the appendiceal arteries. After the wall breaks down, peritonitis and septicemia may follow.

The mortality in this disease depends largely upon the stage at which operation is performed. The value of statistics is thus limited in most instances, simply because information about the stage when the operation is performed is not furnished. The treatment is wholly surgical and the earlier the better.

Delay is the dominant factor causing mortality. The giving of laxatives is the most frequent cause of perforation. The use of the icebag has caused many deaths because it lulls to security by easing superficial pain.

The appendix should be removed when a diagnosis of appendicitis is made, for once appendicitis, always appendicitis. Whenever rupture or gangrene occurs, someone is at fault, and usually procrastination and purgatives are to blame.

The speaker advocated the use of publicity and placards in educating the public never to give a purgative until the physician is consulted, for the "philocathartic propensities of motherhood" must be combated by the medical profession.

The real tragedy of appendicitis is that even one person should ever die of it.

PLYMOUTH DISTRICT MEDICAL SOCIETY

The regular meeting for November of the Plymouth District Medical Society was held at the Moore Hospital in Brockton on Thursday, November 17, 1932, being called to order by the President of the Society, Dr. Charles G. Miles. The records of the last regular meeting were read by the Secretary, Dr. George A. Moore, and were approved.

As chairman of the special committee concerning the chiropractic referendum, Dr. Thomas H. McCarthy, when called upon, said that he believed it was one of the finest demonstrations ever made by the medical profession in the State of Massachusetts, when the chiropractic bill was defeated. In his own words, "every person who has passed the State Board of Registration in Medicine worked hard to defeat

this bill and they succeeded in doing so. Of course there are a good many drones in our society who would not do anything to help out, but I think you will find that type of person everywhere. I firmly believe that too much praise cannot be given to President Halbert G. Stetson and Executive Officer Thomas J. O'Brien for their wonderful interest and the work that they did. I want also to compliment the Council for its interest and the stand that it has taken in helping to defeat this bill. The physicians of Massachusetts, I believe, do not realize what this would have meant to them. It has saved for them thousands of dollars that would otherwise have been spent in some other way.

"If the chiropractors want to practice in Massachusetts I don't see any reason why they should not bring their educational standard up to the standard that the Board of Registration in Medicine demands. I do not feel that that is unreasonable. After they have passed this Board they can practice chiropractic or any other form of healing the sick. Until they do that they should be stopped from being licensed. We don't want any special boards or special legislation. We feel that the people have a right to demand first-class treatment when they are sick and we do not feel that they would get it from the chiropractors. I want especially to thank the members of the Plymouth District Medical Society who helped to defeat this bill here in our own district and know that they did a lot of fine work. They should be commended for their loyalty to the profession."

The committee was given a unanimous vote of thanks for its work.

There being no further business, the program of the morning proceeded, presenting speakers from Providence, R. I., connected with the Rhode Island State Hospital. The first speaker was Dr. Peter P. Chase, who read a very interesting paper on "Cancer of the Mouth." Dr. Chase's paper was freely discussed. The next speaker of the morning, Dr. Philip Batchelder, talked on "The Rôle of the X-Ray in Infections of the Teeth." Dr. Batchelder went into extensive detail in this line of work and demonstrated that he was thoroughly acquainted with his subject. It was a most excellent paper. The next speaker was Dr. B. Earl Clarke, who spoke on "Unusual Sources of Hemorrhage into the Gut." Dr. Clarke talked at length on his subject and demonstrated several pathological specimens, including a specimen of a melanoma and its metastatic distribution. He also had a specimen of a liver and gall bladder which contained three very large stones and the remains of a hemorrhage that was found in the gall bladder. Considerable discussion followed Dr. Clarke's address, which showed careful preparation and painstaking work. The next speaker of the morning was Dr. Charles O. Cook, surgeon at the Rhode Island State Hospital, who spoke on "Problems in Nephrolithiasis." Dr. Cook, during his address, read interesting reports of five cases that he had observed and operated upon. Dr. Cook gave a very excellent talk that was thoroughly enjoyed.

This program presented by the Providence doctors was one of the best that the Plymouth District Medical Society has had in years. The Moore Hospital was crowded. Physicians and surgeons were present from all over Plymouth, Norfolk, and Bristol Counties. Dr. George A. Moore, surgeon-in-chief of the Moore Hospital, addressed the society. He said that he had been entertaining the society, at least once a year, for a good many years, and that this was without doubt the largest gathering of physicians that he had ever seen in his hospital. Those present were enthusiastic about the program.

After the meeting, Mrs. George A. Moore, with the aid of Mrs. Isabel Packard and Miss Priscilla White, served a most excellent turkey dinner.

SOUTH END MEDICAL CLUB

The next regular meeting of the South End Medical Club will be held at the office of the Boston Tuberculosis Association, 554 Columbus Avenue, Boston, on Tuesday, December 20, 1932, at 12 noon.

The speaker will be Dr. Cadis Phipps, Professor of Medicine at Tufts Medical School, and Chief of the First and Third Medical Services, Boston City Hospital, and his subject, "Treatment of Heart Disease."

All physicians are cordially invited to attend. There will be the usual luncheon at 1 o'clock.

BOSTON ORTHOPAEDIC CLUB

Symposium on Arthritis

The second part of the program offered by the Boston Orthopaedic Club on arthritis is scheduled for December 12. The program is as follows:

I

5-6:45 P. M. Dry Clinic at the Robert B. Brigham Hospital by Dr. Loring T. Swaim and Dr. Philip D. Wilson, illustrating operative and non-operative orthopaedic treatment in arthritis.

II

7:00 P. M. Dinner — Vanderbilt Hall, Harvard Medical School. (A moderate charge per plate will be made.)

8:00 P. M. Meeting—Amphitheater, Building B, Harvard Medical School.

1. General Aspects of Treatment—Dr. George R. Minot.

2. The Prevention of Deformity—Dr. Loring T. Swaim.

3. The Surgical Aspects of Treatment—Dr. Philip D. Wilson.

4. Prevention and Community Organization—Dr. Frank R. Ober.

The success of the first part of this Symposium, which took place November 14, leads us to urge that all members of the profession, in any way interested in this subject, attend this program to which they are cordially invited.

NEW ENGLAND HOSPITAL FOR WOMEN AND CHILDREN

The regular clinical conference of the New England Hospital for Women and Children will be held at the hospital, Dimock Street, Roxbury, on Thursday, December 15, at 8 P. M., with the following program: A paper on The Use of Avertin in Nose and Throat Anesthesia; Case Reports on Typhoid Fever in a Child, Toxic Cirrhosis of the Liver with Ascites, Carcinomatosis.

ALICE H. BIGELOW, M.D., *Secretary.*

HARVARD MEDICAL SOCIETY

The next meeting of the Harvard Medical Society will be held in the Peter Bent Brigham Hospital Amphitheatre (Van Dyke Street entrance), Tuesday evening, December 13, at 8:15 o'clock.

PROGRAM

Presentation of Cases.

Digitalis as a Diuretic. By Dr. E. A. Bartram.

Digitalis in the Treatment of Cardiac Disturbances other than Cardiac Decompensation. By Dr. Henry A. Christian.

JOHN HOMANS, M.D., *Secretary.*

THE NEW ENGLAND ROENTGEN RAY SOCIETY

The December meeting will be held at the Boston Medical Library, Boston, Mass., Friday night, December 16, 1932, at 8:00 P. M.

SCIENTIFIC SESSION

"Roentgenologic Diagnosis in Diseases of the Spinal Cord and Associated Structures." John D. Camp, M.D., Mayo Clinic, Rochester, Minnesota.

Discussion by William Jason Mixter, M.D., Boston, Mass.; George W. Holmes, M.D., Boston, Mass.; Merrill C. Sosman, M.D., Boston, Mass.

The usual dinner will be held at the Harvard Club.

C. W. BLACKETT, M.D., *President,*
35 Bay State Road, Boston, Mass.
T. R. HEALY, M.D., *Secretary,*
370 Marlborough Street, Boston, Mass.

NEW ENGLAND PHYSICAL THERAPY SOCIETY

The regular meeting of the New England Physical Therapy Society will be held in the Music Room of the Boston Square and Compass Club, 448 Beacon Street, Boston, Massachusetts, at 8 P. M. on December 14, 1932.

Dr. Charles W. McClure is the Program Chairman for this meeting.

PROGRAM

A Region of Diagnostic Romance, the Stomach, Liver and Pancreas. Charles W. McClure, M.D., Lee MacPhee, M.D., Charles F. Branch, M.D.

General Discussion.

A Round Table Dinner at 6:30 will precede the meeting. Please notify the Secretary if you plan to attend the dinner.

The President urges the members to bring in clinical cases and reports.

All members of the medical profession are cordially invited to attend.

ARTHUR H. RING, *Secretary.*

SOCIETY MEETINGS

CONGRESSES AND CONFERENCES

December 8—Somerville Medical Society. See notice on page 1012, issue of December 1.

December 8—Massachusetts General Hospital. See page 1011, issue of December 1.

December 9—William Harvey Society. See page 1011, issue of December 1.

December 9—New England Pediatric Society. See page 1011, issue of December 1.

December 12—Boston Orthopaedic Club. Symposium on Arthritis. See page 1066.

December 13—Harvard Medical Society. See notice elsewhere on this page.

December 14—New England Dermatological Society. Clinical Meeting, Boston City Hospital at 3 P. M.

December 14—New England Physical Therapy Society. See notice elsewhere on this page.

December 15—Clinics in Medicine at Peter Bent Brigham Hospital. See page 1064.

December 15—New England Hospital for Women and Children. See notice elsewhere on this page.

December 16—New England Roentgen Ray Society. See notice elsewhere on this page.

December 20—South End Medical Club. See page 1066.

February 6-10—The American College of Physicians. See page 765, issue of October 27.

February 8 - April 5—The New England Heart Association. See page 1011, issue of December 1.

February 17 and 18—The New England Hospital Association. See notice on page 911, issue of November 17.

DISTRICT MEDICAL SOCIETIES

ESSEX NORTH DISTRICT MEDICAL SOCIETY

January 4—Wednesday, Semi-Annual Meeting. Program to be announced.

May 3—Wednesday, Annual Meeting. Program to be announced.

ESSEX SOUTH DISTRICT MEDICAL SOCIETY

Tentative Program
1933

Wednesday, January 4, 1933—Danvers State Hospital, Hathorne. Clinic 5 P. M. Dinner 7 P. M. Speaker: Dr. A. Warren Stearns, Dean of Tufts College Medical School.

Wednesday, February 1, 1933—Council Meeting, Boston.

Wednesday, March 8, 1933—Lynn Hospital. Clinic 5 P. M. Dinner 7 P. M. Speaker: Dr. Soma Weiss, Boston City Hospital. Subject: Arterial Hypertension.

Wednesday, April 5, 1933—Essex Sanatorium, Middleton. Clinic 5 P. M. Dinner 7 P. M. Speaker: Dr. Wilson G. Smillie, Professor of Public Health Administration, School of Public Health, Harvard University. Subject: Common Colds.

Thursday, May 4, 1933—Censors' Meeting, Salem Hospital, 3:30 P. M.

Tuesday, May 9, 1933—Annual Meeting. Salem Country Club, Forest Street, Peabody. Golf in afternoon; greens fee $2.00. Dinner at 7 P. M. Speaker: Dr. George Burgess Magrath. Subject to be announced later. **Ladies invited.**

R. E. STONE, M.D., Secretary.

FRANKLIN DISTRICT MEDICAL SOCIETY

Meetings of the Franklin District Medical Society will be held at the Weldon in Greenfield on the second Tuesday of January, March and May.

CHARLES MOLINE, Secretary.

MIDDLESEX EAST DISTRICT MEDICAL SOCIETY

The program of the Middlesex East District Medical Society for the coming year is as follows:

January 11 at Wakefield.

March 15 at Melrose.

May, at the Meadowbrook Club, Reading.

ALLAN R. CUNNINGHAM, Secretary.

NORFOLK DISTRICT MEDICAL SOCIETY

January 31, 1933—Roxbury Masonic Temple, 8 P. M. Subject: "Stomach Surgery"—Motion pictures. Dr. William R. Morrison.

February 28, 1933—Time and place to be announced. "The Diagnosis and Treatment of Anemia," by Dr. William P. Murphy.

March 28, 1933—Time, place and subject to be announced. Speaker will be Dr. J. P. O'Hare.

May—Annual Meeting. Time, place and subject to be announced.

FRANK S. CRUICKSHANK, M.D., Secretary.
1695 Beacon Street, Brookline.

SUFFOLK DISTRICT MEDICAL SOCIETY

Wednesdays at 8:15 P. M.

January 25, 1933—General Meeting in association with the Boston Medical Library at the Boston Medical Library. Titles and speakers to be announced later.

March 29, 1933—Clinical Program, Massachusetts General Hospital.

April 26, 1933—Annual Meeting. Election of Officers. Scientific Program—Titles and speakers to be announced later.

The Medical Profession is cordially invited to attend all of these meetings.

WILLIAM H. ROBEY, M.D., President,
LELAND S. McKITTRICK, M.D., Secretary,
HILBERT F. DAY, M.D., Boston Medical Library.

WORCESTER DISTRICT MEDICAL SOCIETY

Schedule of meetings for 1932-1933:

Wednesday, December 14—Meeting at the Worcester Chamber of Commerce Auditorium. Paper by Dr. Joseph Meigs of Boston, entitled "Uterine Bleeding."

Wednesday, January 11—Dinner and meeting at the Worcester City Hospital. Paper by Dr. Morris Fishbein, Editor of the Journal of the American Medical Association.

Wednesday, February 8—Dinner and scientific meeting at the Worcester State Hospital. Program to be announced later.

Wednesday, March 8—Dinner and scientific program at the Memorial Hospital, Worcester. Program to be announced later.

Wednesday, April 12—Dinner and scientific meeting at the Rutland State Hospital. Scientific program to be announced later.

Wednesday, May 10—The Annual Meeting. Place and program to be announced later.

ERWIN C. MILLER, Secretary.

BOOK REVIEW

The Sign of Babinski: A Study of the Evolution of Cortical Dominance in Primates. By JOHN F. FULTON and ALLEN D. KELLER. Springfield, Ill.; Baltimore, Md.: Charles C. Thomas, 1932. xi + 165 pages. Price, $5.00.

One of the most important reflexes is that described by Babinski in 1898 as a sign of interference with the pyramidal pathway. It has proved to be of inestimable value in clinical medicine, although the explanation of the phenomenon has never been entirely satisfactory. In attempting to throw more light on the problem many investigators have used the lower animals, but the results of their work have been unsatisfactory. This is largely on account of the fact that the reflex is not well developed in the ordinary laboratory animal until one reaches the primates and there, in an ascending scale from the monkey to the chimpanzee, one can study the development of the dominance of the cerebral cortex. This is the problem which Professor Fulton and his associate have been working on for a number of years, at the physiological laboratory in Yale University, and the book under consideration gives the results of their long-continued research.

Taking advantage of the newer technique of surgical exploration of the cerebral cortex and also of the modern anesthetics, Professor Fulton has been able to operate on a large series of animals with only an occasional fatality. In an appendix to his book he gives some very remarkable data in regard to the use of anesthetics and particularly neurosurgical methods as devised by Dr. Cushing and others. He has taken advantage of the latest developments in electrosurgery and finds that these methods, now used in many hospitals, can be equally well applied to animal experimentation. The secret of his success has been the particular care which he has used in handling his material, a technique which was evident only in the large neurosurgical clinics of the world before its adoption by Professor Fulton.

The details of his operations on monkeys, baboons, gibbons and chimpanzees are not, perhaps, for the general reader, but one cannot help but admire the care which he has taken to note the daily changes in the Babinski and other reflexes after operation. The illustrations of the book are superb, many of them careful drawings of the cerebral cortex at the time of operation. There is a short note on the clinical implications of the Babinski reflex, with its historical development.

The investigations of these reflexes, however, are far more complete and one cannot draw many definite conclusions, even after the long researches reported in this volume. It seems obvious that to study the reflexes and other signs used in clinical neurology, it is necessary to use only the higher primates in order to obtain comparative results. Much has been learned by studying the lower animals, but, on the other hand, many things which apply to them do not find any recognition in work in the clinic. As one ascends the scale of evolution, one finds that the levels of function approach more closely to those of man and, moreover, precise cortical localization appears similar to that found in the human being. That this is so is, perhaps, not surprising, but the actual demonstration of it through research on a single reflex has only been made clear by Professor Fulton's excellent investigations.

BOOKS RECEIVED FOR REVIEW

Arbeiten aus der dritten Abteilung des Anatomischen Institutes der Kaiserlichen Universität Kyoto. Edited by Prof. Dr. Seigo Funaoka. *Die Schläfenbeinzellen* by Dr. Kenji Yamashita. 62 Pages.

A New Theory of Cancer and Its Treatment by C. F. Marshall. Part II. Published by John Wright & Sons, Ltd. 56 Pages. Price 3/6 net.

Anatomy of the Brain and Spinal Cord by William W. Looney. Second Edition. Published by F. A. Davis Company. 370 Pages. Price $4.50.

Diseases of the Spinal Cord by Williams B. Cadwalader. Published by The Williams & Wilkins Company. 204 Pages. Price $5.00.